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ABSTRACT

The ecological theme of "We all need each other--the web of life" serves as the focus of Alaska's fourth annual wildlife week and as the emphasis for the activities in this guide for primary teachers. The packet of materials contain: (1) an introduction (explaining the theme); (2) table of contents (indicating each lesson's objective and location of background sheets, student worksheets and activities, and curriculum integration ideas); (3) list of worksheets (providing titles, summaries, and page numbers for the 11 activities); (4) worksheet solutions (listing answers and/or explanations for each of the exercises); (5) glossary (offering an illustrated dictionary of selected ecological terms); (6) lessons (containing objectives, background information, vocabulary list, activities, and curriculum integration suggestions); (7) classification guide (explaining the five kingdoms of living things); (8) Alaskan food chain and food web examples (citing specific relationships common to four ecosystems); and (9) a reference list. (ML)

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Alaska Wildlife Week 1986
Introduction

This is the fourth annual Alaska Wildlife Week . This annual celebration of the importance and value of wildlife to Alaskans is a time for learning about wildlife and conservation. In recognition of this event, the Alaska Department of Fish and Game, Nongame Wildlife Program annually prepares a new set of educational materials for teachers throughout the state. We began developing the packets in response to teacher requests for Alaska-specific information on wildlife and conservation. Originally patterned after the National Wildlife Week sponsored by the National Wildlife Federation, Alaska Wildlife Week has continually evolved in response to teacher's needs, requests, and evaluations. We hope that these 1986 materials are the best yet.

Separate Primary, Upper Elementary, and Junior/Senior High School Teacher's Guides were prepared this year to make the materials easier for you to use during Alaska Wildlife Week, and throughout future years. Be sure you have the appropriate Teacher's Guide. Also included are more posters, many easy to duplicate worksheets, and a wide variety of activities for use with your regular curriculums. This year's packet is organized so that each lesson builds on the previous ones. The activities are intentionally varied to meet the differing needs of teachers and students throughout Alaska. Feel free to pick and choose among the materials based on your particular situation and your students. Adapt and modify activities or worksheets if you desire. The important thing is to get the concepts across.

As always, we would like to encourage you to integrate Alaska Wildlife Week with other conservation education materials-- Project WILD, Alaska Sea/River Week, CLASS Project, and National Wildlife Week all offer additional ideas, approaches, and perspectives on wildlife and the natural world.

The Alaska Wildlife Week 1986 theme is "We all need each other --the web of life." The unit is on ecology--the study of the inter-relationships among living things and their non-living surroundings. Ecology is a synthesis of many sciences and has application in all human endeavors. In learning to understand ecology, students will be challenged to think, question, observe, and reflect about wildlife--a topic in which most students are inately interested. The study of ecology can lead students to an interest and appreciation for all the natural sciences--biology, chemistry, and physics. Further, ecology is a science that is critical not only for wildlife conservation, but also for the future of humans.

Never-the-less, ecology has been called "an elaboration of the obvious". Don't allow yourself to be frightened off by an occasional scientific-sounding word. Ecology is probably the easiest science to understand, and certainly one of the most fascinating. At some level, most people know the basic concepts of ecology without really being aware of it. Oddly, however, gaining an awareness of these intuitively obvious concepts is like putting on a pair of glasses that allow you to see the world as though for the first time.

Please use this packet and help your students put on a pair of "ecology glasses" that will let them see the world around them with new eyes.

P.S. Keep your notes, hang on to your packets, and incorporate your favorite lessons and activities into your curriculum. The Alaska Wildlife Week theme changes every year, but the information and materials in each year's packets continue to be relevant. In addition, the themes all center around wildlife and are interlocking. If you have saved materials from past years, you'll find many of them relevant to this year's Alaska Wildlife Week theme.

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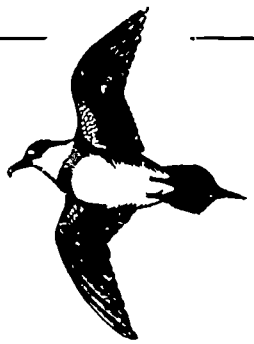
WORKSHEET SOLUTIONS



1. SECRET SCIENCE WORDS--Top row: air, sunlight, water, dirt; Second Row: plants, animals; Third Row: algae, fungi; Fourth Row: microscopic organisms; Last Word ecosystem.

2. LIVING THINGS WORKSHEET--Top Row--4-non-living (NL); 3-living (L); 0-I; Second Row--5 -L; 6-NL; 1-NL; Third Row--10-L; 7-L; 2-L; Fourth Row--5-L; 9-NL; 7-L.

3. CONSUMER WORKSHEET--Student should draw in a picture of a consumer, and write in what it eats. (You can tell them what to draw and write down using information on page 48.)

4. NAME THAT CONSUMER--Top to bottom: herbivore, carnivore, detritivore, omnivore.

5. PRODUCER WORKSHEET--Students fill in a picture of a plant or algae and the word photosynthesis.

6. CONSUMERS NEED HELP--Students should draw in pictures of plants and/or algae.

7. FOOD CHAIN WORKSHEET--The four food chains all begin with sunlight and minerals cards. They are then as follows: kelp--snail--sea star--sea cucumber; dwarf dogwood--pine grosbeak--merlin--mushroom; algae--mosquito larvae--phalarope--bacteria; alpine sunflower--Dall sheep--wolf--springtail.

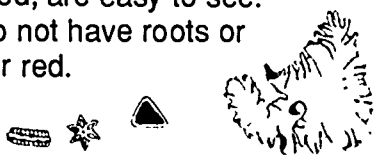
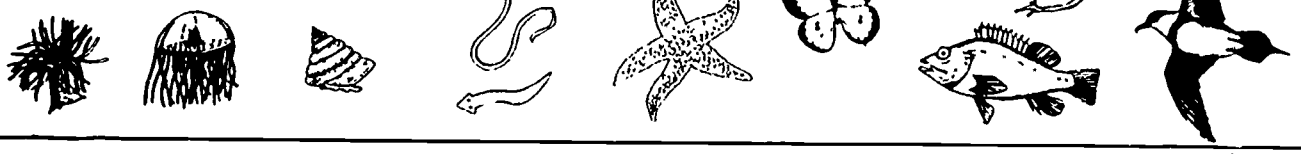
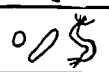
8. ECOSYSTEM MAZE--The line should pass through the Producer square first, then herbivores to camivores to detritivores, then back to the bottom.

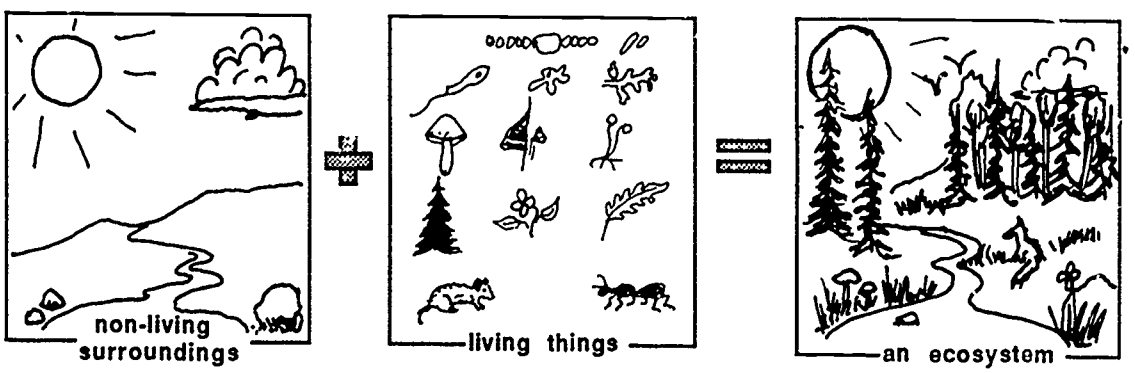
9. ECOSYSTEM PARTNERS--Top left--connect dots to show a woodpecker; top right--student should draw in a butterfly, bee, hummingbird, or other insect; bottom left--any plant with berries; dots connect to form a brown bear.

10. WHO NEEDS WHO--Students should circle all the living things in each row. (Chickadee--The woodpecker digs holes for chickadee to nest in and depends on fungi to soften wood, (also to recycle minerals), all these need the tree for oxygen, chickadees and woodpeckers eat insects. Wolf--needs plants to produce oxygen and food for its prey, Dall sheep and other hoofed mammals, plants need insects to pollinate them and fungi and bacteria to recycle minerals. Weasel--eats voles, which eat berry-producing plants. The plants also produce oxygen. The plants need the fungi in order to take up nutrients. Harbor Seal--eats fish, which eat zooplankton, which eat algae.)

11. ECOSYSTEMS AND PEOPLE--Students should color in all the activities.

My Ecosystem Dictionary

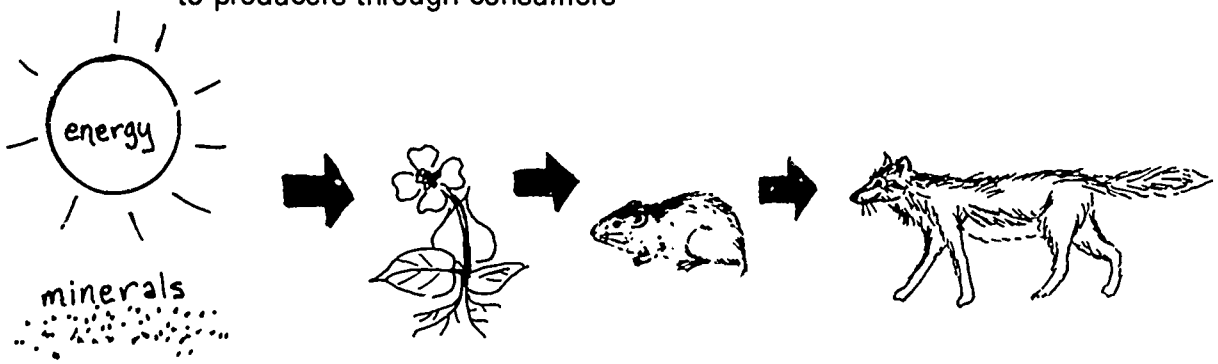
algae 	a kind of living thing. Most algae live in wet places or in the water. Some just float around, while others grow on rocks. Some algae are too small to see. Some, called kelp or seaweed, are easy to see. Some algae look a little like plants, but they do not have roots or leaves. Algae can be green, yellow, brown, or red. 
animals 	one of the five great groups of living things. All animals are big enough to see easily. Most animals move around a lot, and get food by eating other living things.
bacteria	a kind of microscopic living thing; many are important detritivores 
carbon dioxide	a gas that most living things give off (breathe out). Plants and algae also breathe it in.
carnivore	a living thing that eats living animals or other consumers
consumer	a living thing that gets food by eating other living things
detritivore	a living thing that eats dead things and waste materials; sometimes they are called decomposers.
ecosystem	the non-living surroundings plus all the living things in an area



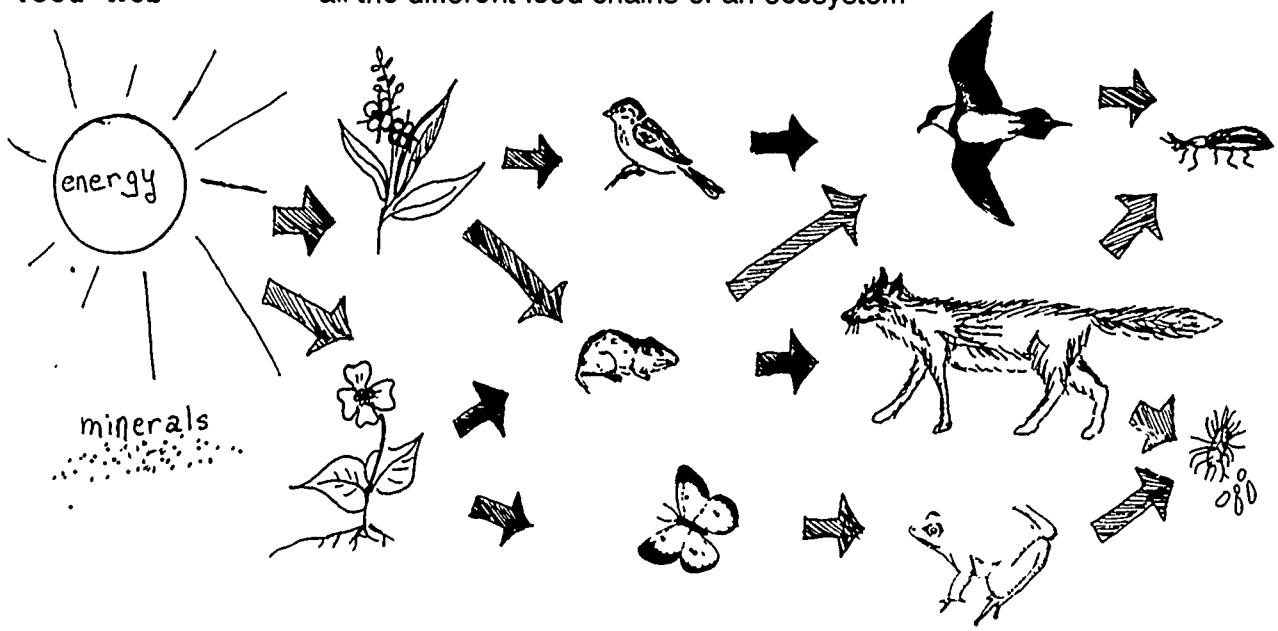
energy — the force that makes things move

food — energy and minerals in a form living things can use

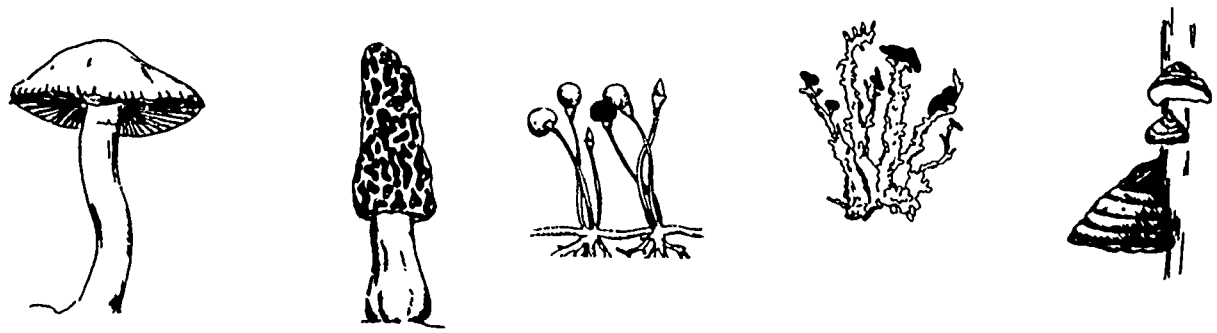
food chain — the path of energy and minerals from the non-living surroundings to producers through consumers

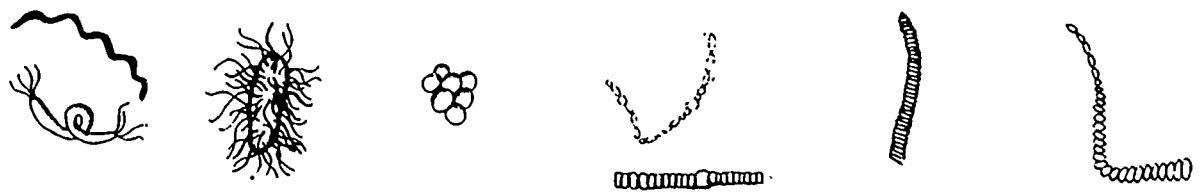
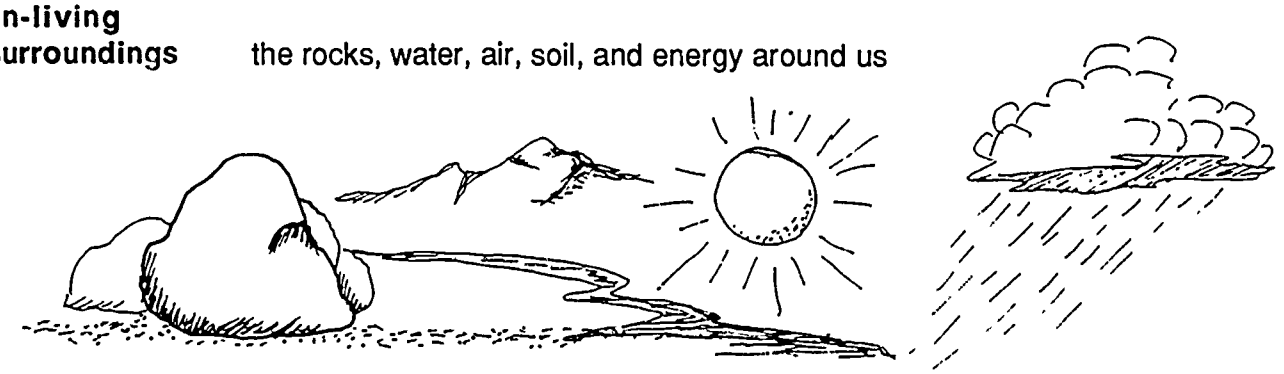


food web — all the different food chains of an ecosystem

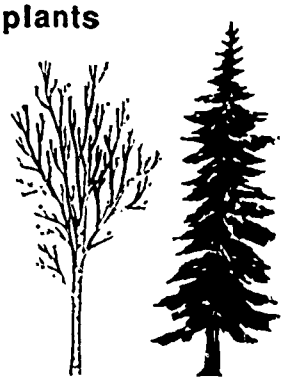


fungi — one of the great groups of living things. Most fungi do not move around but live their lives in one place. Most eat dead things and waste materials. Many fungi are white, but some are brown, green, red, yellow, or black.

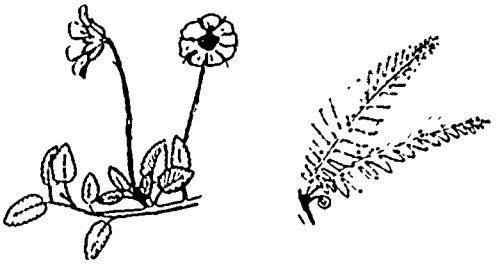


herbivore	a living thing that eats producers (such as plants or algae)
interdependent	needing each other
living thing	something that is able to move, grow, and make new things like itself
microscopic	too tiny to see, unless you use a microscope
minerals	the substances that make up living and non-living things
monerans	one of the five great groups of living things; includes only microscopic things like bacteria and blue-green algae 
non-living surroundings	the rocks, water, air, soil, and energy around us 
omnivore	a living thing that eats both producers and consumers
organism	a living thing
oxygen	a gas that most living things breathe in and need in order to live
photosynthesis	the way that plants and algae change sunlight, water, and carbon dioxide are changed into food

plants



one of the 5 great groups of living things; includes all the living things that have leaves, roots, and stems. Nearly all plants are green and live their lives without moving from place to place. All plants are producers.



pollination

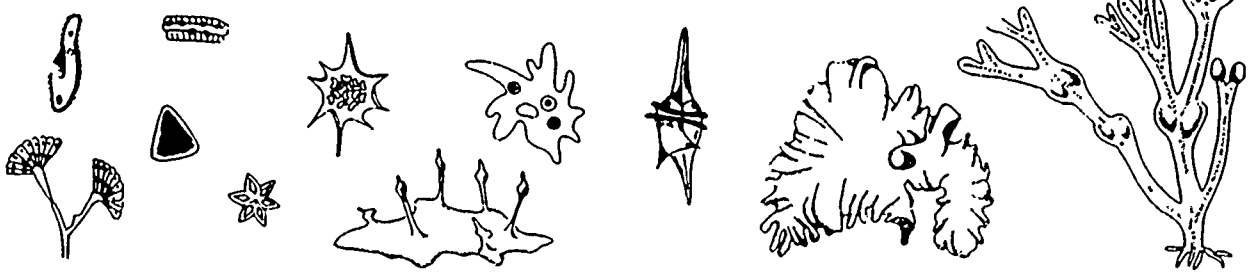
carrying pollen (small yellow grains) from one flower to another; needed by many plants in order to make seeds.

producer

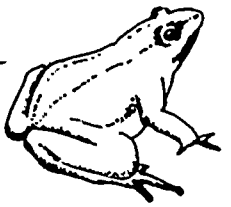
any living thing that makes its own food; plants and algae are both producers

protists

one of the 5 great groups of living things. This group includes some microscopic living things called protozoans, and algae, seaweeds, and slime molds.



Lesson 1.



Students will recognize that ecosystems are made up of non-living and living things, and be able to differentiate and give examples of each of these.

Background. All ecosystems include the non-living surroundings and living things. The non-living surroundings include air, water, rocks, soil, and sunlight (and energy in other forms, such as heat). Both living and non-living things are made up of the same things--elements and energy. Living things are differentiated from non-living things by their abilities to move, grow, and reproduce themselves. The two most familiar groups of living things include plants and animals. These were once considered the only groups of living organisms, but many living things did not really fit into either of these groups. So, today, scientists classify living things into 5 different groups, or kingdoms. The 5 "great groups" of living things (listed on page 47 and shown on the "Living Things" poster) are easy to learn. As a teacher, you may want to become familiar with them. Primary students need not learn the groups, but they should learn to recognize a few organisms from each group as kinds of living things.

Vocabulary: *air, algae, animals, bacteria, ecosystem, energy, fungi, living, microscopic, non-living, plants, soil, rocks, water.*

Introductory Activity.

Objectives:

1. Students will practice listening, memory, visualization, and classification skills.
2. Students will be able to identify the living and non-living components of an ecosystem.

Materials:

Alaska Wildlife Week posters, photos of several natural areas

Procedure:

1. Most students spend a lot of time outdoors and may already be familiar with a variety of living and non-living things. This excercise will help them to think of the non-living and living things they are already familiar with and encourage them to look for additional kinds. Ask students to close their eyes, listen carefully, and imagine they are on a walk through a nearby natural area. Explain that you will read a few lines to get them thinking, but then they will continue their walks by using their imaginations. Read the following passage aloud to the class.

What a beautiful day for a walk through an ecosystem. The sky is filled with big fluffy clouds. Still, the sun is shining through one big patch of blue. The sunshine feels warm on my coat, but the air is still a little chilly. Most of the winter snow has melted. The ground is wet and muddy. Perhaps I will be able to find some animal tracks. High overhead, a flock of geese honk wildly. They are heading north with the spring. I have the whole day to explore this ecosystem. I wonder what I will find....

2. Wait a few minutes. Ask students to name some of the things they saw on their "walk." List each realistic item on the board. If students listened carefully, the list should include sunshine, clouds, water, snow, and geese. They may have visualized plants, animals, people, or other items. Prompt them to think of as many things as they can. Use a few of the items as examples of living and non-living things. Help students to figure out the differences between these.

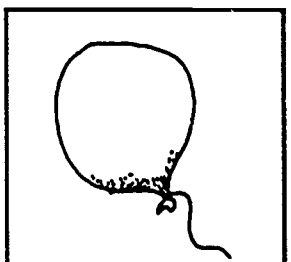
3. Ask students if they remember the name of the place they are "walking" through., Do any students remember the word, "ecosystem"? Explain that anywhere they go on earth they will be in an ecosystem. Ecosystem is a word that describes all the living and non-living things that occur in an area. Use the Alaska Wildlife Week photo poster and the Non-living Surroundings, and Living Things posters to review with students the wide variety of living things that occur in ecosystems. How many of the organisms shown did students visualize on their ecosystem walk? Point out some of the organisms they didn't think of. Add to the list on the board any of these that students have seen, or think may occur in the ecosystem around your school. Then ask students to hold thumbs up for living things, and thumbs down for non-living things while you review the list of non-living and living thingson the blackboard.

4. Have students look at the Ecosystems poster and/or photos of several natural areas and find the similarities in the areas. What do all the ecosystems include? (Non-living things and living things). If at all possible, go outside (even if just in the school yard) and have students identify living and non-living things around them. Follow-up with other activities, and the Secret Science Words and Living Things Worksheets.

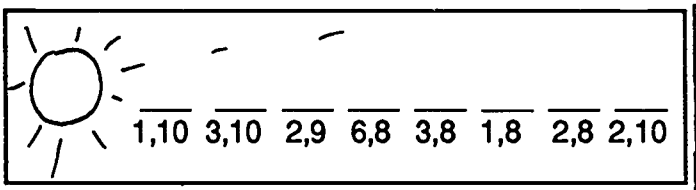
SECRET SCIENCE WORDS

Name _____

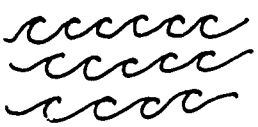
Primary



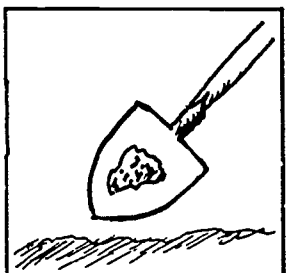
1,7 5,12 6,9



1,10 3,10 2,9 6,8 3,8 1,8 2,8 2,10

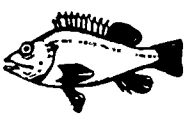


5,10 1,7 2,10 1,12 6,9



4,7 3,8 6,9 2,10

4,9 6,8 1,7 2,9 2,10 1,10



1,7 2,9 3,8 1,9 1,7 6,8 1,10

1,7 6,8 1,8 1,7 5,7

2,12 3,10 2,9 3,12 3,8

1,9 3,8 3,7 6,9 3,9 1,10 3,7 3,9 4,9 3,8 5,11

3,9 6,9 1,8 1,7 2,9 3,8 1,10 1,9

12	e	f	g	h	i	j
11	y	z	a	b	c	d
10	s	t	u	v	w	x
9	m	n	o	p	q	r
8	g	h	i	j	k	l
7	a	b	c	d	e	f
	1	2	3	4	5	6

Break the secret code by matching the numbers to letters using the Code Breaker Key shown on the left. If the code says, 4, 9---- find the letter by finding where column 3 and row 7 meet---Did you find the letter p? Can you find 2, 11? If you found the letter z, you can to break the code! Find the secret words for all the living and non-living things that all together, make up an:

1,12 3,7 3,9 1,10 1,11 1,10 2,10 5,7 1,9

Living Things Worksheet

Name _____

Primary

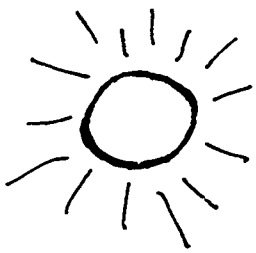
1+ 3 =____

7 - 4 =____

2 - 2 =____

9 - 4 = ____

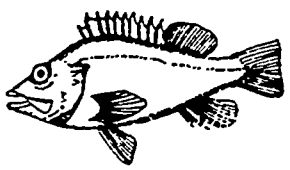
2 + 4 = _____



6 - 5 = ____

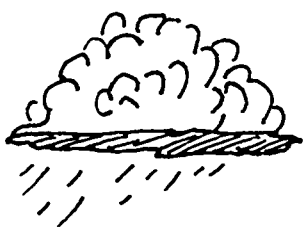
5 + 5 =____

10 - 3 =_____



10 - 8 = _____

3 + 2 =____



5 + 4 =_____

5 + 3 = _____

Circle the non-living things and color in the living things. Then solve the math problems and use the code below to check your answers.

If the answer equals 1, 4, 6, or 9, the picture shows a non-living thing.
If the answer is 0, 2, 3, 5, 7, or 10 the picture shows a kind of living thing.

Activity Ideas for Curriculum Integration

LANGUAGE ARTS ART

Objectives: Students will practice classifying and will become more familiar with the non-living and living things that make up ecosystems.

Materials: Old magazines and/or books with photos of nature or wildlife; index cards (3x5 or 5x7); or xerox copies of the drawings on the poster.

Procedure: (This step may be done in class, as homework, or as preparation by the teacher) Have students go through the resource materials looking for photos of living and non-living things. Ask students to cut out pictures (or use the photos as references to draw pictures) of living and non-living things that occur in ecosystems. Have students draw (or paste) their pictures on to separate index cards. Have each student make 5 cards, with each card showing just one living or non-living thing. If desirable and feasible, have students write the name of the pictured item on the card.

Shuffle all the cards together. Divide the class into groups, then pass the cards out to the groups. (Or, have students play individually). Explain that the object of the game they are going to play is to get rid of all their cards. They do that by correctly classifying the item pictured. You will call out a category, living or non-living (or plants, animals, fungi, etc.). If a group has a card that fits the category, they should hold it up. If their classification is correct, they may discard the card to a central pile. If their classification is wrong, they have to draw another card from the pile and they can't discard. Allow the groups time to come to a joint decision about which card to hold up. First group to get rid of all their cards wins.

SOCIAL STUDIES

Objectives: Students will learn about world geography, the variety of environments found around the world, and the similarities in these areas.

Materials: Photos or slides of wild areas around the world.

Procedure: Identify the locations where the photos were taken on a world map or globe. Then have students look carefully at all the photos. What do the photos have in common (air, water, soil, sun, plants, animals, etc.)? Students should eventually realize that the same kinds of living and non-living things are found all over the world. Have them guess whether or not they might find other similarities if they visited the areas. Would they all have insects? Microscopic living things? Fungi? (Representatives of all 5 kingdoms of living things are found in nearly all habitable environments on earth)

LANGUAGE ARTS

Objectives: Students will practice non-verbal communication skills and become more familiar with the living and non-living things that occur in ecosystems by pantomiming things that occur in ecosystems.

Materials: drawings, photos, or names of living and non-living things on index cards, Living Things worksheet (optional)

Procedure: Review the differences between living and non-living things-- the ability to move, respond to environment, grow, and reproduce. Place drawings, photos, or names (If desired, xerox, cut-up and use the Living Things Worksheet) of various living and non-living things in a jar. Divide the class into groups. Have each group draw an item from the jar. Allow the group to decide how to pantomime the selected item. Then have the groups take turns pantomiming their item. The other groups get one guess each on whether they are pantomiming a living or non-living thing. Each group should either write down their guess, or tell it to the teacher. Each group that guesses living or non-living crrectly gets 1 point, and the group that was acting gets 1 point for each group that correctly answered--indicating they were good actors. You may choose to award bonus points to both the actors and guessing group, if any can identify the pantomimed item more specifically (i.e. animal, plant, fungi, microscopic organism, seaweed, or other categories). Play one or more rounds. Winners are the group with the most points.

SCIENCE ART

Objectives: Students will become more aware of the variety of living and non-living things in the world around them by visiting a nearby area , making and recording observations.

Materials: Warm clothes for being outside, plain paper, pencils or crayons. Small jars for collecting water. Optional--binoculars, hand lenses for students--some may be able to bring these from home.

Procedure**: Have each student make up a notebook of 5 sheets of paper. They should label the papers as follows: 1) The Non-living surroundings; 2) The Plants; 3)The Animals; 4) Other Living Things; and 5) The Ecosystem.*** Students should bring these notebooks (with a clipboard or book for a hard surface to write on and pencils or crayons) with them to the field. Before going out in the field, use the Alaska Wildlife Week posters to review the variety of non-living and living things found in ecosystems. Discuss what kinds of things they might see and where each would be recorded in their books. You may want to take the posters with you into the field to remind students what they are looking for.

This excercise will focus student attention on each of the various kinds of things found in ecosystems. By searching and recording each kind separately, they will form search images and notice things that they might other wise overlook. When you reach the field trip site, have students spread out, within easy hearing range, then sit down facing away from each other (i.e. looking at the ecosystem--not at you or each other.) Have them turn to page 1 of their notebooks, then look at the ecosystem around them. and draw a picture of the area that includes only the non-living things. Coach them to notice the air, water, soil, sunlight, rocks, etc. Allow a few minutes for them to sketch.

Then, have them turn to the next page, and draw just the plants. Encourage students to draw all the different plants--not just the most obvious ones. Look for those far away, close at hand, very large, small, etc. Ask them to look for flowers. Plants with round leaves, long narrow leaved plants, ferns, mosses, and others. By searching for plants that fit a variety of descriptions they are likely to notice ones they would have overlooked. Allow time for observation and drawing.

Repeat for animals. After they have looked closely near at hand, have them explore a set area to see if they can find other animal s ign. Have them draw in any animals they see, hear, or of which they find sign. Then ask them to look for specific kinds of animals--insects? birds? mammals? other kinds (snails, worms, spiders, frogs)? Can students see any animal sign--droppings, browse marks, tracks? (If necessary, you can resort to having them draw animals that might live there--but they should be able to at least find insects).

Have students sit down again and look for other kinds of living things, such as algae, seaweeds, mushrooms, lichens, shelf fungi, or slime molds. Have students collect samples of pond or puddle water to take back to class, so they can look for microscopic living things, too. (In the classroom, put a tiny bit of the water on a slide, cover it with a coverslip, then put it under low power on the microscope, then focus and find some organisms for students. Let students look . Ask each one to describe what they see, whether it is moving , and then add a drawing of the microscopic creatures to their books. To complete their Ecosystem book, have students draw a picture of the ecosystem they visited. Their other pages could be used as notes on what to include in their ecosystem picture.

Possible Evaluation: Evaluate the ecosystem drawings to see if students recognize that a picture of an ecosystem must include the non-living surroundings and a variety of living things.

**Procedure Modification: For Kindergarten and first grade children, you may want to have several parents or aides along , divide into small groups, and have each group put together one notebook. Or, assign each group make just one page for a class notebook--if you do this, have each group point out the things they found to the other groups before leaving the site. Alternatively, you could do the activity orally--go through each group, and have each student try to see something in that category--then call on individual students to show what they found to the rest of the class. You could bring a large tablet of paper (11x17 or larger) and sketch the items quickly yourself. Or, after reviewing the various groups of things orally, divide the class into small groups and have each group make a drawing of one of the categories--or an ecosystem drawing that includes things from each category.

***Older students could use 7 sheets--divide the 4th one (Other Living Things) into a) The Fungi, b) The Algae and Seaweeds, and c) The Microscopic Living Things--Monerans and Other Protists.)

Lesson 2.

Primary

Students will recognize that all living things need minerals and energy and get these from their foods, and that different kinds of living things eat different foods.

Background. All living things need minerals and energy in order to live. Living things need minerals--these are the substances that make up all living things. Our cells, blood, bones, muscles and fat are all made up of various minerals. In order to move, grow, sense the environment and reproduce , all living things also need energy. (For example, humans need energy to move our limbs, to power our heart and lungs, and on a molecular level, to re-arrange and re-combine mineral molecules.) Most living things get the energy and minerals they need by consuming (or eating) food. All living things that get energy and minerals by consuming, are called consumers. Different kinds of living things eat different foods.

Some living things, called herbivores, eat mainly plants or algae. Dall sheep, singing voles, butterflies, mosquito larvaeare all herbivores. Consumers that get energy and minerals by eating plant-eating (or algae-eating) consumers (herbivores) are called carnivores, which means flesh-eaters. Phalaropes, weasels, and seals are examples of carnivores.

Detritivores, (sometimes called decomposers) are organisms that get energy and minerals by eating waste materials and dead organisms. Fungi, slime molds, many insects, and many microscopic organisms (such as bacteria) are detritivores. Bald eagles, crabs, ravens, and other large animals that scavenge dead animals are also detritivores. Some organisms eat a wide variety of foods and are called omnivores. All these living things get their energy and minerals by eating other living things (or their wastes).

Vocabulary: *carnivore, consumer, detritivore (or decomposer), energy, herbivore, mineral, omnivore*

Introductory Activity.

Objectives:

Students will be able to explain that all living things get the minerals and energy they need to live from their foods and will be able to categorize living things according to what they eat.

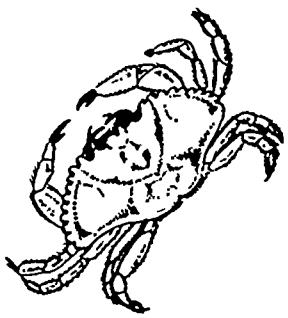
Materials:

Bulletin board; Headings for the board that read "Eats plants or algae," "Eats living things that eat plants or algae" "Eats dead things or waste materials." and "Eats a variety of things." If desired, add the vocabulary words: herbivore, carnivore, detritivore, and omnivore to these headings. A wind-up toy, pins, copies of the Consumer Worksheet for each student, crayons and pencils.

Procedure:

1. Ask students what they need in order to live. If they can't think of anything, tell them that lunch and dinner are cancelled today. Do students then recognize that they need to eat in order to live? Discuss what humans get from our foods. Explain that we get two things: minerals, and energy. Explain that we need minerals inorder to build our bones and muscles. We need energy in order to move around--jump, play games, write, breathe, or do anything. You can demonstrate minerals and energy by showing the difference between a wind-up toy before (minerals only) and after you add wind it up (added energy)--when it is both minerals and energy.

2. Remind students of the ecosystem they visited and all the living things they found out there. Discuss what all those living things do in the ecosystem--they move around, grow, and raise young. Ask students whether they think those other living things need food. Reiterate that all living things need minerals and energy in order to move, grow, and to raise young. So where do the living things in an ecosystem get food? Use specific examples of wildlife in your area and ask students: " Do (caribou) eat dirt?" "Do (salmon) eat air?" Most likely, students will vehemently disagree. So, if they don't eat non-livingthings, what do living things eat? Students should realize that most living things eat other living things. Have students name a few living things and tell what each kind oforganism eats.



(If students don't know what a kind of organism eats, or think it eats something it doesn't, help them find the correct answer in books or references about wildlife.) List the examples on the board along with what they eat. Pick a few other examples of living things (except not plants or algae) from the photo poster (or other references you have). Be sure to choose an example of a fungi. Discuss what each one of those living things eats. (The back of the photo poster tells what each pictured organism eats. See posters from past years, too.) After looking at a few examples, ask students what all the foods are. They should note that all the foods are living things or the remains of living things.

3. Put the headings you made across the top of the bulletin board (leaving space on the left side for another column to be added in Lesson 3): "Eats plants or algae." "Eats living things that eat plants or algae." "Eats dead things or waste materials." and "Eats all kinds of things." (If desired you can also show the names of these groups, Herbivores, Carnivores, Detritivores, and Omnivores.) Discuss the categories, then have students classify the animals listed on the board.

4. Refer to the Alaskan Food Chain/Food Web Examples given on page 48. Write the names of the consumers listed in one of the ecosystems on the board. Have students pick one, or assign each student a different one. Hand out copies of the Consumer Worksheet. Then have each student draw a picture of their organism on the Consumer Worksheet. (Students may need to get a reference picture of their consumer; however, most are shown on the Living Things or Ecosystems posters.) Then have them list the main thing their organism eats, then 1 or 2 other things it eats. (You can tell them what each consumer eats based on the information on pages 49-50, or have students go to the library and find the answers.)

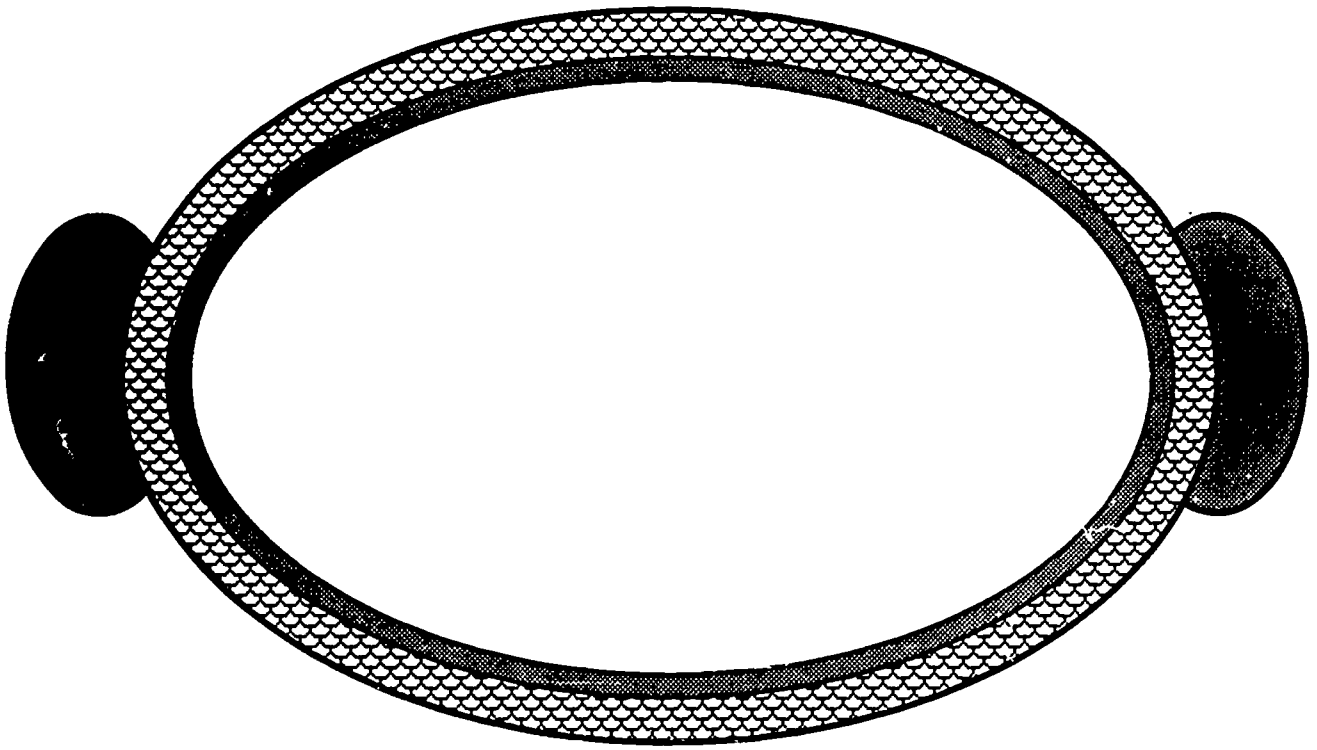
When students are done with their drawing and have filled in the blanks of the worksheet, have them cut out the framed picture of the organism and the information. Then they should paste the information on the back of their drawing. Have each student pin their card on the board under the correct category. Have the class help if needed.

OPTIONAL--If students can understand the concept, you may also want to discuss our need for air, especially if students thought of breathing as something humans need to do in order to live. Explain that nearly all living things must breathe in order to be able to get the energy and minerals out of food. We breathe in a gas called oxygen, which we use to break down our food, and breathe out a gas called carbon dioxide. If a living thing runs out of oxygen, it can't get the energy out of its foods, so it dies. That is why it is important to punch holes in the lid of a jar that you keep an insect in. Its also why we have windows in our houses. Otherwise, we would soon use up all the oxygen and the air would be full of carbon dioxide. Carbon dioxide gas is poisonous to most living things if there is too much of it in the air.

Primary

Consumer Worksheet

Name_____



This is a picture of a

_____

It is a kind of consumer. It eats mainly

_____

It also eats _____

Name That Consumer

Name_____

_____

_____

Scientists use special names for living things that eat different kinds of things. Use the secret code at the bottom of the page to find out these names.

Some living things eat plants or algae.

Scientists call these consumers

___	___	___	___	___	___	___	___	___	___
8	5	18	2	9	22	15	18	5	19

Some living things eat other consumers.

Scientists call these consumers

___	___	___	___	___	___	___	___	___	___
3	1	18	14	9	22	15	18	5	19

Some living things eat wastes and living things that have died.

Scientists call these consumers

___	___	___	___	___	___	___	___	___	___	___	___
4	5	20	18	9	20	9	22	15	18	5	19

Some living things eat both plants and other consumers.

Scientists call these consumers

___	___	___	___	___	___	___	___	___
15	13	14	9	22	15	18	5	19

Code Breaker Key

a	b	c	d	e	f	g	h	i	j	k	l	m
1	2	3	4	5	6	7	8	9	10	11	12	13
n	o	p	q	r	s	t	u	v	w	x	y	z
14	15	16	17	18	19	20	21	22	23	24	25	26

SOCIAL STUDIES ART

Objectives: Students will recognize that humans are consumers that eat both plants and other consumers; we are omnivores.

Materials: Crayons and paper; optional: old magazines with pictures of foods; consumer worksheet.

Procedure: Have students draw pictures or cut out pictures from old magazines of foods that people eat. Discuss which of the foods come from animals, which are from plants, and which are made using both plant and animal parts. Have students draw a picture of themselves on another consumer worksheet and fill in answers to the question about what they eat. Have them cut the picture out and paste the information on the back, then place themselves in the correct group on the bulletin board that was made in the introductory activity. (living things that eat both plants and animals--omnivores).

SCIENCE

Objectives: Students will recognize that different kinds of consumers have different kinds of teeth (or bills).

Materials: Skulls of various mammals including some carnivores, omnivores, and herbivores. (Check at a local museum, with ADF&G, high school biology teachers, or local trappers and hunters to obtain examples of these.) Alternatively, look at pictures of bird beaks.

Procedure: Divide the skulls into groups according to their food habits (i.e. herbivores in one area, carnivores in another, and omnivores in another). (Save out 1 or 2 examples to evaluate student understanding after the lesson.) Have students go to each station and look at all the skulls carefully. Have them look for similarities in the teeth of the animals in each group. Do the skulls all have sharp pointed teeth? Flat hind teeth? Or do they have both kinds of teeth. Have students try to guess what kind of consumers are in each group, then (optional) what kind of animal each skull is from. Then compare the skulls orally, and point out the similarities of the teeth within groups, and the differences between the groups. (Carnivores have teeth that are like knives--sharp for ripping and tearing apart meat. Herbivores have rear teeth that are flat for grinding. Omnivores have both kinds of teeth.) Identify the animals the skulls are from.

Possible Evaluation: Have students look at a mystery skull and determine what kind of consumer it is from. Have them look at human teeth (or feel their own). What group of consumers do humans belong to?

LANGUAGE ARTS

Objectives: Students will become more familiar with the words describing different kinds of consumers by acting out their meanings.

Procedure: Ask students to imagine that they are the living thing that they drew a picture of for the Consumer Worksheet. Have them imagine how the animal acts when it is trying to get food, or is eating. Does it just walk along and munch on plants, or does it sneak along and pounce out suddenly to catch some other living thing. Or does it just sit in one place and absorb food from waste materials or remains (like a fungi). Or, does it sometimes act one way and sometimes another . Pick out 3 or 4 students that are herbivores and have them come up and act like their animals act when they are feeding. You may need to give them hints. Repeat for carnivores, omnivores, and detritivores.

Write the names of the different kinds of consumers on the board. Then, pick out some behaviors the kids made up to represent the different kinds of consumers and have the whole class imitateeach behavior. For example, they should raise their arms, show their teeth, and take a small leap forward when you say carnivore. Or, walk along slowly, nibbling at imaginary plants on one side then the other to show a herbivore. Alternate these behaviors to show an omnivore. Sit in one place, arms out, fingers extended to show a detritivore. Review the behavior associated with each type of consumer a few times.

Have the class stand in a circle--or by their seats. You call out a word, and/or point to it on the board. The students then act like that kind of consumer. (You may choose to have anyone who does the wrong action sit down.) Call out another word, and have students act it out. Then, repeat several times, varying the order you read the words in, and with less and less time in between reading the words.

Lesson 3.

Primary

Students will be able to explain that plants (and algae)get energy and minerals from their non-living surroundings.

Background. Like all other living things, plants and algae need minerals and energy. But in contrast to other living things, plants and algae do not eat other living things; they are not consumers. Instead, they are called producers, because they can use minerals and energy from the non-living surroundings to make or produce their own food. Plants and algae store energy from sunlight by a process called photosynthesis. Photosynthesis is simply the change of carbon dioxide (from the air), water, and sunlight (energy) into sugar--(or stored energy) and oxygen. Plants make their tissues (leaves, flowers, stems, roots) by combining the sugar (stored energy) produced by photosynthesis with minerals from the soil. Algae make their cells by combining the sugar produced by photosynthesis with minerals that are dissolved in water.

All ecosystems include producers--living things that are able to make food by using minerals and energy from then non-living environment. Plants are the main producers in forest and tundra ecosystems, while algae (includes seaweeds) are the main producers in ocean ecosystems. Producers, (plants, algae, and certain monerans) are critically important for the survival of all life on earth, because they change energy and minerals from the non-living surroundings into forms that other living things can use. They are also critically important because they remove carbon dioxide from the air, and replace it with oxygen--the gas that nearly all living things must breathe in order to use the energy and minerals in their foods.

Vocabulary: *algae, carbon dioxide, energy, food, minerals, oxygen, photosynthesis, producer, plants, soil, water.*

Introductory Activity.

Objectives:

1. Students will be able to explain that plants get the energy and minerals they need from the non-living surroundings.

Materials:

A plant, the bulletin board from Lesson 2 Introductory Activity, but add a column heading "Makes Food from Non-living Things" (Producers). Also, the sunlight, water, carbon dioxide cards from this packet (p. 21-22), an equal number of index cards labeled minerals, a balloon (blown up) labeled "air" attached to a table, a large construction paper cut-out of the sun, a pitcher of water (or a picture), and a magazine picture or drawing of soil on a bulletin board (or around the plant pot), each of these visual aides should have a paper cup stapled or taped up beside them. Put the carbon dioxide / oxygen cards on the table (some with the carbon dioxide side up and some with the oxygen side up) . Place the other cards in the appropriate cups. Photocopies of the Producer Worksheet for each student in class.

Procedure:

1. Set a potted plant (and/or an algae or seaweed) on a table in front of the class. Ask students to watch the plant for a little while. Then ask them if it is a living thing. What do they think the plant is doing. Does it move? Eat? Breathe? Grow? Have the class act like plants. They are to just sit in the sunlight with their roots in the soil. (Or, have them act like algae--floating on the sea) Let them act out for just a minute or two, then ask how long they could really do that before getting hungry. One hour? One day? Why do they need to eat? (Reiterate that all living things, including plants and algae, must eat food in order to get the energy and minerals needed to move, grow, and reproduce.) So what do plants and algae do? Do they eat anything? Can students figure out that plants must do something else to get food? 2. Explain that plants and algae are able to do something that most living things can not do--they can get energy and minerals from the non-living surroundings and make food for themselves. Review the parts of the non-living environment using the display. Explain thatsunlight is really a kind of energy, and that soil and water have minerals in them. Plants are able to get minerals out of the soil and water with their roots, and algae just soak in minerals

Primary

from the water. And, by a special process, called photosynthesis, plants are able to capture the energy of sunlight. (For younger students, you may choose to skip to step 5 rather than explaining photosynthesis in detail).

3. Ask students if they'd like to act like plants again. Explain that in order to be plants they'll have to learn how to do photosynthesis. Demonstrate the process of photosynthesis by picking up the appropriate cards from the table (carbon dioxide) and from the labeled cups (water and sunlight) as you explain: The plant takes carbon dioxide from the air, and its roots get water from the soil. The plant or algae then catches a ray of sunshine and mixes these together to get stored energy and oxygen. Turn the cards over to show that the cards together spell these words.

3. Have each student come to the front of the room and act like a plant by "doing" photosynthesis Have each student pick up the cards that show the things a plant (or algae) needs to make food, then turn the cards over to spell "Stored Energy and Oxygen."

4. Now discuss what the plant (or algae) does with the food and oxygen that it made. Explain that the plants put the oxygen into the air, where other living things can use it. Then they use the stored energy, along with minerals from the soil, in the same ways that other living things use the food they eat--to, grow, move, and reproduce (make seeds).

5. Pass out the Producer Worksheets to students. Refer to the Alaskan Examples of food chains and webs (p. 48) to choose examples of producers from the same ecosystem as the consumers they drew pictures of in Lesson 2. Have students draw pictures of these producers. (Most of the producers listed are shown on the Living Things, Ecosystem, or photo poster. Or, have students refer to books on plants for additional pictures to draw from.) Help students spell out the name of the plant or algae, and write out the word photosynthesis. Then have them cut out their framed picture and the information below. They should paste the information on the back of the [illegible] 3, then pin their picture up on the board under the new category, "Makes Food from Non-living Things" (producer). Use the Consumers Need Help worksheet for follow-up.

EXTENSION:

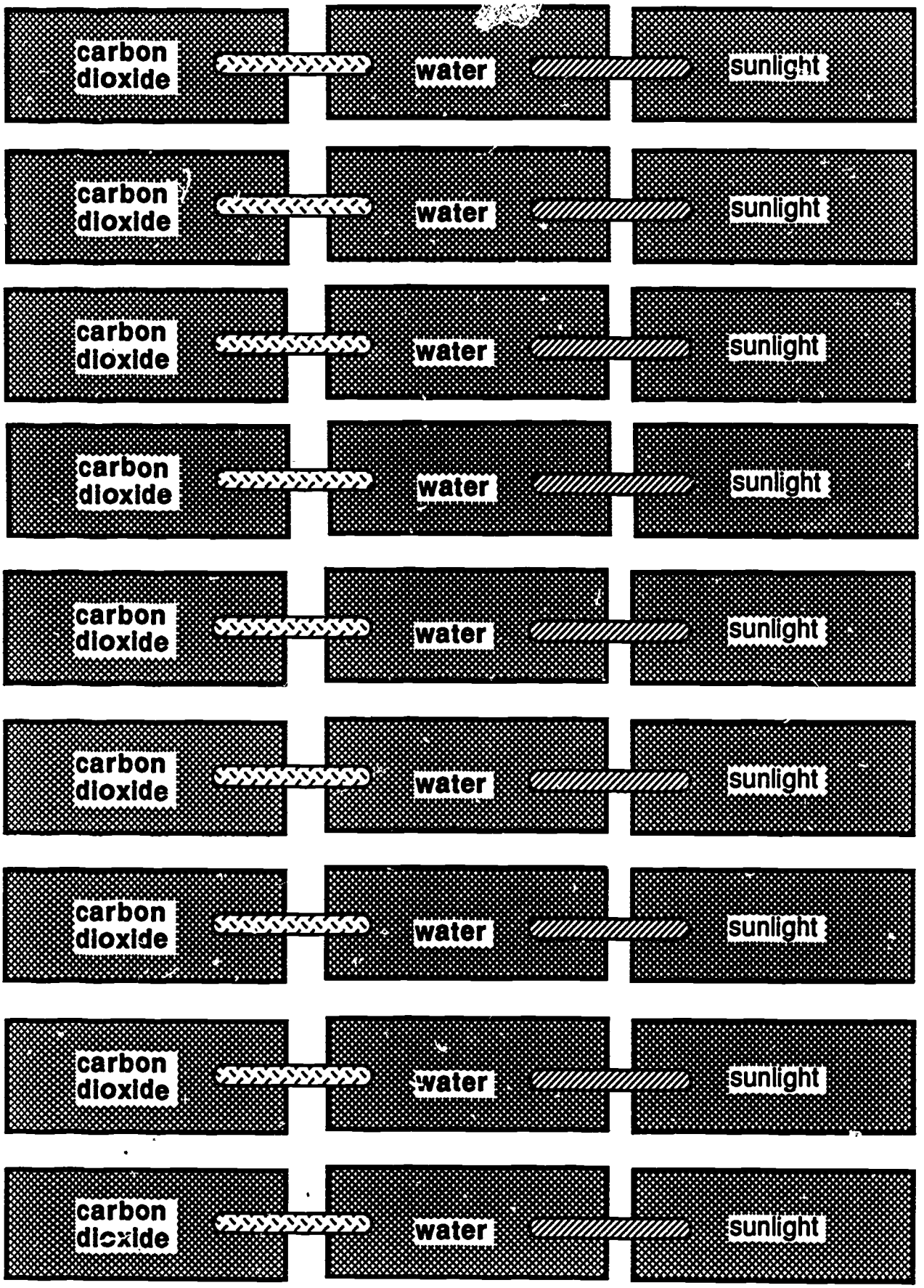
Objectives: Students will recognize that plants make the oxygen needed by all other living things.

Materials: carbon dioxide/oxygen cards p. 25.

1. Have everyone hold their breaths. Discuss how long they were able to do this. Why did they have to stop and breathe? Explain that most living things need a gas called oxygen in order to use the energy and minerals in their foods. Humans and most other living things, including plants and algae, breathe in oxygen and breathe out another gas called carbon dioxide.

2. Spread the oxygen/carbondioxide cards out on the table and explain that the table represents the air of an ecosystem. Reiterate that nearly all living things must breathe in oxygen, and then breathe out carbon dioxide. Ask for volunteers to come up to represent living things. Explain that these students will pretend they are breathing (as all living things do), by picking up oxygen cards and turning them over, into carbon dioxide. Each player can continue playing as long as they have oxygen to breathe, but if they don't get any oxygen they will die and be out of the game. Help the class guess what will happen to the players. Will they run out of oxygen? Allow the actors to "breathe" and find out. (They will run out of oxygen.)

3. Explain thatplants and algae are very special because they can do something that very few other living things can- take carbon dioxide out of the air and put back oxygen. Ask for more volunteers to act like plants and algae in the game. Explain that when plants and algae do photosynthesis, they take carbon dioxide out of the air, combine it with water and sunlight, to make food (which they use) and oxygen (which they put into the air). So, on each turn, plant and algae players will pick up 2 carbon dioxide cards and turn these over--to show that they are doing photosynthesis. Plants and algae also need some oxygen in order to use the energy they store and minerals from the soil, so the plant and algae players should also pick up 1 oxygen card and turn it over on each turn. Now, can students predict what will happen when they replay the game with players who are plants and algae, and players who are other living things? Replay to test their hypothesis. (The other living things won't run out of oxygen because plants will keep making more).


carbon dioxide
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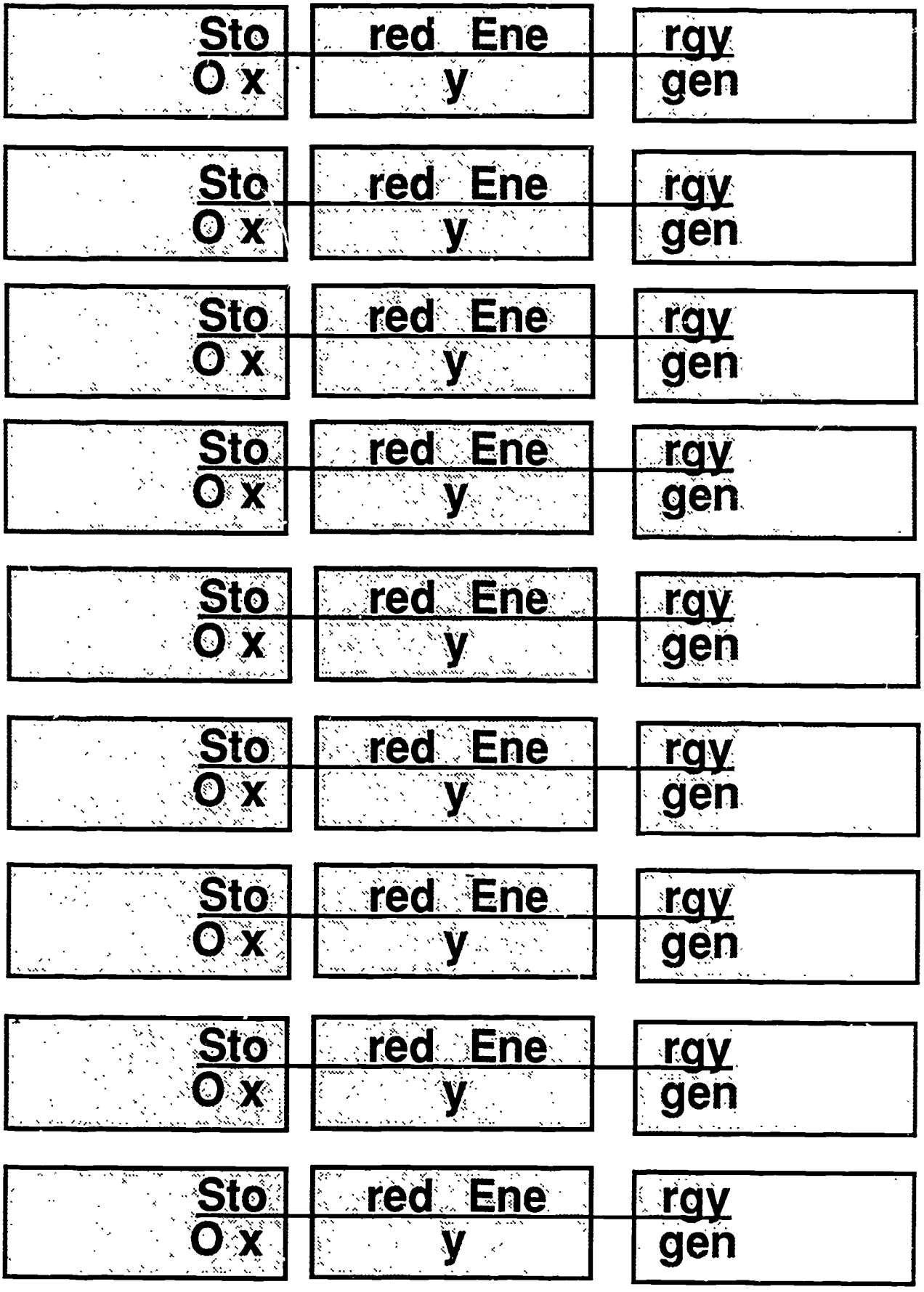
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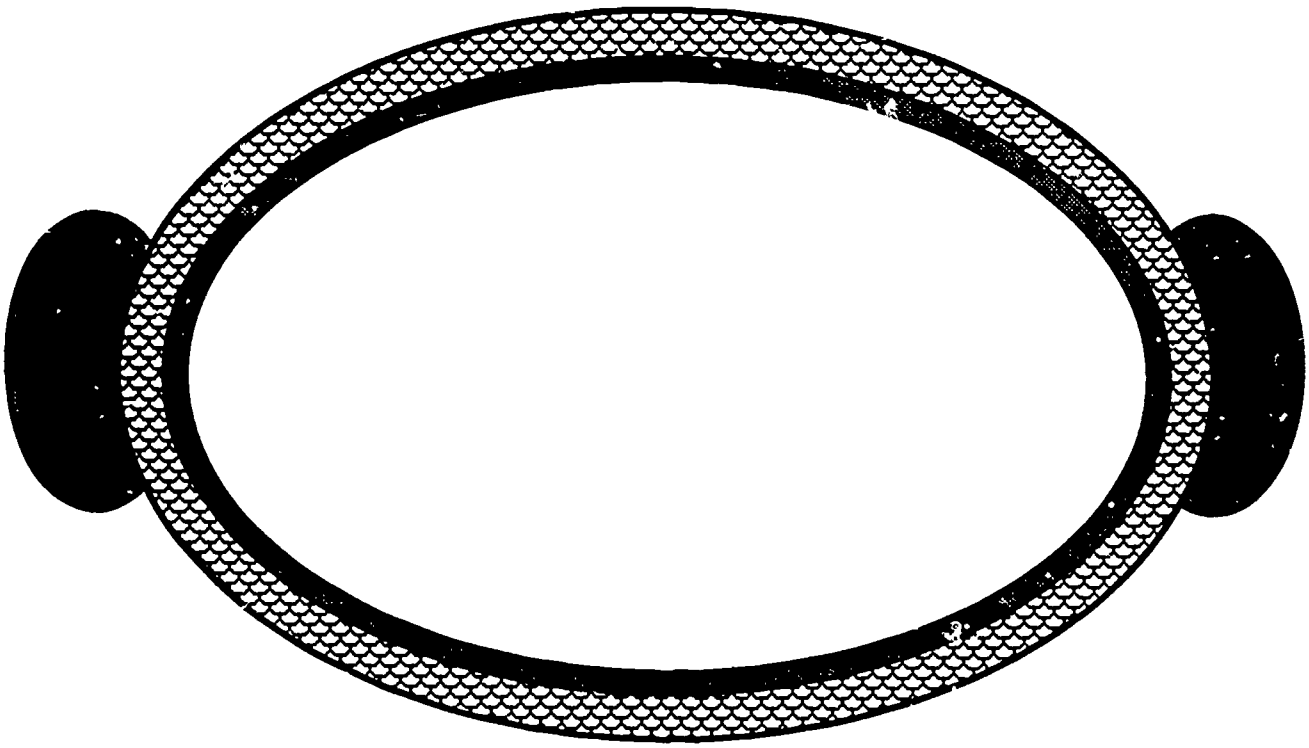
PRODUCER WORKSHEET

Name_____



This is a picture of

_____

It is a kind of producer.

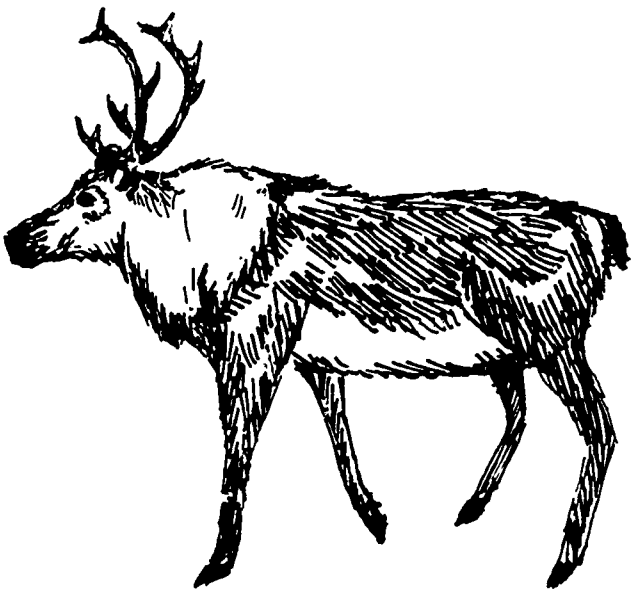
It stores energy from sunlight by

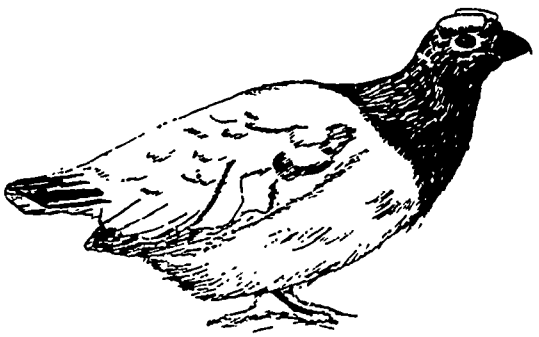
_____

It gets minerals from the soil or water.

Consumers Need Help

Name_____





Help! These animals don't have any any food to eat or any oxygen to breathe. Please draw in something to help them.

These cards are for use with the extension of Lesson 3 Introductory Activity that teaches students about the value of producers in removing carbon dioxide from the atmosphere and replacing it with oxygen. Make 2 or 3 photocopies of this page. Cut each sheet along the ..... lines, both horizontally and vertically. Then fold each card in half and tape or glue them shut. Each sheet will give you 15 cards that say oxygen on one side and carbon dioxide on the other.

Oxygen	Oxygen	Oxygen
Carbon Dioxide	Carbon Dioxide	Carbon Dioxide
Oxygen	Oxygen	Oxygen
Carbon Dioxide	Carbon Dioxide	Carbon Dioxide
Oxygen	Oxygen	Oxygen
Carbon Dioxide	Carbon Dioxide	Carbon Dioxide
Oxygen	Oxygen	Oxygen
Carbon Dioxide	Carbon Dioxide	Carbon Dioxide
Oxygen	Oxygen	Oxygen
Carbon Dioxide	Carbon Dioxide	Carbon Dioxide

Activity Ideas for Curriculum Integration

SOCIAL STUDIES ART MATH

Objectives: Students will become more aware of their surroundings and the importance of producers.

Materials: Photos of a variety of indoor and outdoor settings with (suburban, rural, forests, tundra, wetlands) and without plants (cities, parking lots, icefields, sand dunes, the moon's surface), (Optional: a room with lots of plants and a room without any plants), crayons, and newsprint or butcher paper.

Procedure: Show the class the various photos of outdoor settings and have students choose the 2 or 3 places they would most like to live. Hold each photo up and ask all those who chose it as one of their favorites, to raise their hand. Write the number of students choosing each place on a card next to the photo. Repeat for the indoor photos. Then separate the photos into the ones with many plants and those with few or none. (You may want to have 4 groups--indoors-- with and without plants, and outdoors-with and without plants.) Have students add up the number of votes for the photos with plants and the number for places without plants. Is there any difference? Why might students choose the ones with plants? Next, ask students which outdoor photos show places that an animal (use a specific example) might like to live. Why might most animals prefer to live in places with many plants? (Because they get food and shelter from plants, and because other living things they eat or depend on are more likely to live in such an area.

Finish up by having students draw a picture of an outdoor place where they would like tc live. Do they show plants in their drawings?

ART

Objectives: Students will observe plants or seaweed closely and make posters that show their appreciation of these ecosystem producers.

Materials: Crayons, newsprint or butcher paper, access to the outdoors or a variety of plants from your area.

Procedure: Explain to students that not everyone realizes how important producers--plants and algae--are, so the class is going to make posters to tell other people about producers. (Individual students may each make a poster, or you can have groups or the whole class work on giant banners. You may want to have one group work on algae and seaweed, and another on plants.) If possible, get students outdoors where they can look at plants and/or algae first hand and make sketches or crayon etchings for their poster. Encourage them to show the variety of plants that occur in the ecosystem on their poster. Have each student complete the sentence "Plants (Algae) are important because..." . Then, have them add the sentence to their posters as a caption.

SOCIAL STUDIES

Objectives: Students will recognize the importance of plants to people.

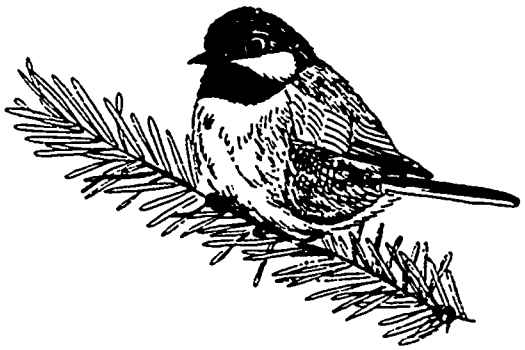
Materials: (Optional--photos of food from magazines.)

Procedure: Ask students to name the things they like to eat for meals and snacks, or take an imaginary trip to the grocery store and make a list of the foods in the store. Or, use the photos of food from magazines. Discuss what each food item is, or is made from . How many are plant parts (fruits, vegetables, nuts)? How many are made mainly from plants (bread, cake, etc.)? Of the foods that are not plants or made directly from plants, how many are from animals that eat plants? How many are from animals that eat other animals? What do the prey animals eat? (Plants). Students should eventually realize that ultimately, all food for people comes from plants too. (Have the class make cookies, or bread, and trace out where each of the main ingrediants comes from.)
Discuss other ways that plants are important to people. Are any plants used to make things? (wood, rubber). Do students enjoy seeing trees, grasses, flowers? What effects do plants have on air quality? (One study showed that an acre of forest removes nearly 1 ton of dust from the atmosphere each year.)

Lesson 4.

Primary

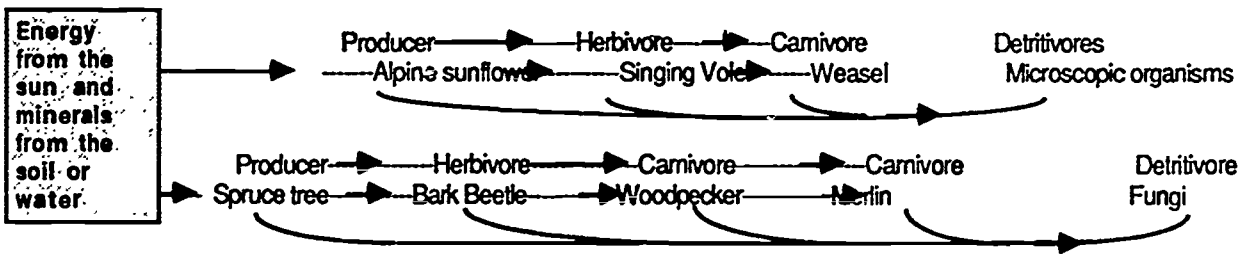
Students will understand that the energy and minerals in food made by plants is passed between animals through food chains and webs.



Background. Energy and minerals are exchanged in ecosystems through food chains and webs. A food chain simply traces the route of energy and minerals from the non-living surroundings through living things. Producers, such as plants or algae, convert energy from the non-living surroundings into a form that they can use, and a form that other living things can use. Producers use some of the energy they store--to grow, move, ward off predators, respond to their environment, and reproduce. But they also store some, along with minerals, in their tissues (celsls, leaves, stems, roots, etc.). Any living thing that eats a producer gets the energy and minerals stored in that producer. The herbivore uses some energy, stores some, and loses the rest in its waste materials. The carnivore that eats the herbivore gets the energy and minerals stored in its body. Once again, the carnivore uses some energy, store some, and loses some in waste materials. The carnivore may be eaten by another carnivore or an omnivore. At each link in a food chain, some energy is used. This energy returns to the non-living surroundings as heat and can not be re-used. Thus, a food chain ends when the last bit of energy is removed by a detritivore..

Detritivores, or decomposers, as you know, are organisms that get energy and minerals from eating waste materials and dead organisms. Detritivores form links with every other food chain link, because they eat waste and dead material from producers, herbivores, and carnivores. Detritivores are very important, because they use up the last bit of stored energy, and turn waste materials and dead things back into the raw materials (carbon dioxide , water, and other minerals) that plants need to store more energy from the sun and make new food. Without detritivores, these raw materials would soon be stored in dead organisms, and plants would be unable to continue producing oxygen and new food. Because of the activities of detritivores, all minerals taken up by living things are returned to the non-living surroundings, and can continuously recycle through ecosystems.

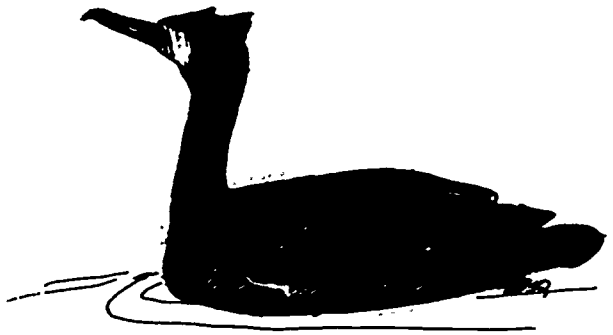
Here are two examples of food chains that occur in Alaskan ecosystems. Most of the organisms in both are shown on the 1986 Alaska Wildlife Week poster. The detritivore links are often not shown in examples of food chains, but they are very important and should not be left out.



The simplicity of a food chain makes it an easy concept to understand. The exchange of energy and minerals through ecosystems is not really that simple however. Most living things eat a variety of things. Most herbivores eat a variety of plants; most carnivores eat a variety of other consumers. Some organisms eat detritivores. A better picture of the exchange of energy and minerals in ecosystems is a food web that shows connections between all the living things that eat each other.

Vocabulary: *food chain, food web*

Introductory Activity.



Objectives:

1. Students will be able to construct a food chain and food web to show the connections between the living things of an ecosystem.

Materials:

Student illustrations of consumers and producers from Lesson 2 and 3, construction paper (cut into 1" x 4" strips, unless you want students to do this), scissors, staples, a ball of string, staplers.

Procedure

1. Explain to students that all the living things in an ecosystem need each other in some way. One way that living things need each other is for food. Use the bulletin board made up during the last two lessons to show that herbivores need plants and algae, carnivores need herbivores, and omnivores and detritivores need all the other living things. Draw arrows to show the connections between the groups. Explain that all the living thingsin an ecosystem are connected by food chains. A food chain shows what eats what--or looking at it from another way, it shows how energy and minerals move from the non-living surroundings through living things and back to non-living things.

Explain by drawing a picture of the sun and soil (or water) on the left hand side of the black board. Ask students what living things use these. They should know that producers use these. Use the food chain examples given in the introduction (or make up your own example) to show that the energy and minerals from the non-living environment are changed into food by a producer, which is eaten by a herbivore, which is eaten by a carnivore. Draw a picture of the chain on the board using the names (or pictures) of the living things involved. Ask students what eats the things that die and the waste materials. Add in the name of a specific detritivore and show arrows connecting it to all the living things.Go over a few more examples until students seem to clearly understand the idea.

2. Then explain that you are going to take down their drawings from the bulletin board and have them re-order the living things into food chains. Divide students into groups, then take down the cards and give each group at least one set that matches up. After they have ordered the food chain in their drawings (check to be sure they got it right), have them cut out several strips of construction paper about 1 inch wide and 4 inches long. (You can cut these beforehand if desired) (Have each group use different colors of links. They should make these strips into loops by stapling the ends together. They can then use these to chain together their food chain links. Hang the food chains up around the room.

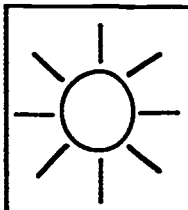
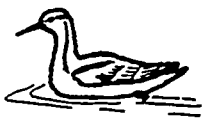
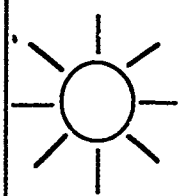
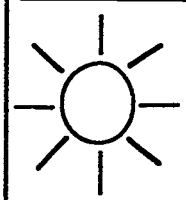
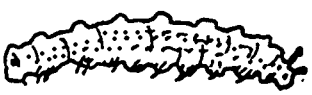
3. If your students can read well, have them lay the food chains out on the floor with the information sides of the links facing up. Then have them look for other connections by comparing the lists of what each animal eats. Whenever they find a new connection, they should connect the two links, but this time by making a chain of construction paper loops long enough to reach between the diagrams so that the whole thing can lie flat. When the whole thing is done, it can be hung from the ceiling. Then kids can look up and see the pictures of all the living things, and all the connections in their ecosystem food web.

4. Follow-up with the Food Chain Worksheet.

Food Chain Worksheet

Name_____

Color and cut out the cards below and put them in order to make 4 different food chains found in Alaskan ecosystems.

 and minerals	Kelp  I make food from energy and minerals.	Snail  I eat kelp.	Dwarf Dogwood  I make food from energy and minerals.
Merlin  I eat pine grosbeaks.	Pine Grosbeak  I eat the berries of dwarf dogwood.	Bacteria  I eat wastes. I live in a wetland.	Phalarope  I eat mosquito larvae.
Mushroom  I eat dead things in forests.	Springtail  I eat dead things on the tundra.	 and minerals	Sea Star  I eat snails.
 and minerals	Alpine Sunflower  I make food from energy and minerals.	and minerals	Mosquito Larvae  I eat algae.
Wolf  I eat Dall sheep lambs.	Algae  I make food from energy and minerals.	Dall Sheep  I eat alpine sunflowers.	Sea Cucumber  I eat wastes in the sea.

Ecosystem Maze

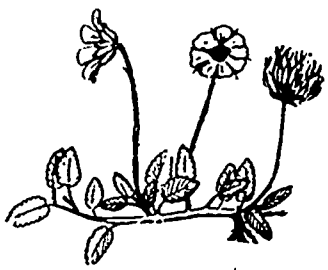
Name_____

_____

_____

Producers

make food from sunlight, carbon dioxide, water..... and minerals.



Herbivores

eat producers like plants or algae.

Detritivores

eat dead things and waste materials.

Carnivores

eat living things that eat producers.

START

Can you help these minerals in the non-living surroundings find a way through the food chains of this ecosystem and back to the non-living surroundings?

Language Arts

Objectives: Students will strengthen their understanding of the food chain concept by writing and acting out a food chain story.

Materials: Reference materials on wildlife.

Procedure: Write the following up on the blackboard:

.....

This is the sun that sent the energy, and this is the soil (or water) that had the minerals.

This is the "producer" that made the food by using the minerals from the soil and catching the energy from the sun.

This is the "herbivore" that ate the "producer" that made the food by using the minerals from the soil and catching the energy from the sun.

This is the "carnivore" that ate the "herbivore" that ate the "producer" that made the food by using the minerals from the soil and catching the energy from the sun.

This is the "detritivore" that returned the minerals to the soil, by eating all the waste materials. So, that is our food chain story. The soil once more has minerals and the sun is shining down, so here are the producers, herbivores, carnivores and detritivores--ready to start again.

.....

Divide the class into groups of 5 or more students. This activity can be done in two ways depending on your students' abilities. You may have students invent their own food chains, using reference materials to figure out what various living things eat. Or, provide each group with the living things that make up a food chain, then have them decide what order they fit into the story. If necessary you can also supply the information on what each living thing eats. (See pages 47-48).

Once students have selected the living things in their food chain, they should figure out how to act out each line in their story. For example, to show the sun they may hold their arms over their heads. To act out a wolf, they may want to show their teeth, or howl. Once the groups have their stories ready, have them present them to the class as a skit. The story can be narrated by one of the group members or by you, if necessary. Students may replace the terms (producer, herbivore, carnivore and detritivore, with the names of the living things they chose--or leave the terms in and have the class try to guess the living things in their food chain story.

SCIENCE

Objectives: Students will act out the exchange of minerals and raw materials from the non-living surroundings through a food chain.

Materials: 8 index cards labled "Minerals" and 20-50 cards labeled "Energy" with a square divided into quarters to place check marks; 12 paperclips or other means of clipping cards together temporarily. Name tags labeled Producer (1); Herbivore (1); Carnivore (1); and Detritivore (2).

Procedure: Spread minerals cards around the area where students will play the game. Select a student to represent each of the following and explain their roles as follows:

Sun player--continually tosses out energy cards

Producer: Takes a minerals card and an energy card from the non-living surroundings and make these into food (by paperclipping them together). They show use of energy by checking one square on each energy card they pick up and make into an "energy sandwich". Producers can only use energy cards that do not have any check marks on them, and can only use minerals that are not already paperclipped to an energy card.

Herbivore: Gets food by taking 2 energy and minerals "sandwiches" from the producer player. They must check off one square on each energy card in the sandwiches. They then keep one sandwich and toss the other to the floor as "waste".

Carnivore: Gets food by taking 2 energy and minerals sandwiches from the herbivore. Otherwise they do the same thing as the herbivore--check off energy squares and toss one card and keep one.

Detritivores: Pick up energy sandwiches from the floor--"wastes". They also check off one square on each energy card they pick up. If this fills up all the squares, they remove the paperclip and toss the paperclip and minerals card back to the floor near the producer.

The game starts by the producer making sandwiches from non-living things; when it has made 2, the herbivore takes these; when the herbivore has 3 sandwiches; the carnivore takes 2; the detritivore starts picking up sandwiches from the floor as soon as they are available. The object of the game is to keep the energy and minerals flowing through the "food chain".

What happens if the producer is removed? (All the other living things run out of food) What if the detritivores are removed? (the producer runs out of minerals, and can't make any more food). Follow-up with the Ecosystem Maze.

Lesson 5.

Students will recognize that living things depend on other living things for reasons other than food.

Background. All living things need producers, like plants, to make food and oxygen, and each living thing needs the living things that it feeds on. For example, snowshoe hares need willow plants to eat, and lynx need snowshoe hares (and since snowshoe hares need willows--so do lynx). Most living things also depend on organisms other than those they are connected to through food chains. For, example, neither lynx nor snowshoe hares eat spruce trees, but both depend on the overhanging branches of spruce for shelter from bad weather and protection from predators (in the case of lynx, to protect their kittens from hawks and owls). Most living things within a particular ecosystem are interdependent.

Here is an example of the interdependence of certain birds, fungi, and squirrels. Tree and violet-green swallows, chickadees, nuthatches, boreal and saw-whet owls, and flying squirrels nest in holes in dead trees. These animals can not dig their own nest holes. Instead, they have to find a hole that has already been made by some other living thing. These animals usually use holes that were made by woodpeckers. Woodpeckers are not able to dig holes in just any dead tree--they can only excavate a hole if the wood is partly decayed or rotted by fungi. The fungi, in turn, rely on other organisms (such as insects, or beavers) to kill the trees, because most fungi can only eat dead wood. The fungi also rely on woodpeckers and squirrels to carry their spores to other dead trees. (A spore is a fungi's way of reproducing--similar to a seed.)

Plants depend on a variety of other living things. In order to make seeds, many plants need to exchange pollen with other plants. Some plants rely on the wind to carry their pollen, but many kinds of plants depend on animals to perform this important task. The plants that need this help produce colorful, or sweet-smelling flowers and a sugary liquid called nectar. The flowers attract animals, such as bees, butterflies, moths, and hummingbirds, that eat nectar. While sipping the nectar, these animals get a dusting of pollen, which they then carry off to other flowers.

Some plants also need animals to carry their seeds. Some plants produce seeds with small hooks or awns that catch or grab on to animal fur--in this way they get a free ride to a new area. Other plants, like blueberry, dogwood, raspberry, and cranberry, produce edible berries. The animals that eat the berries get the energy and minerals in the berries' fleshy outer coats. The hard-coated seeds inside, however, pass through the animal's digestive tract intact, and are deposited in a new area--with a bit of fertilizer.

Many plants (some scientists estimate 80% of all species) are closely associated with certain fungi (mainly mushrooms). The fungi (the underground hyphae of mushrooms) live in or on the roots of the plants. Scientists are still trying to understand the interdependence of the plants and fungi. Apparently, the plant roots give certain foods to the fungi, and the fungi somehow help the plant roots to get certain minerals (such as phosphorus). Many plants depend on certain bacteria in a similar way. The bacteria live on the plant roots; they get nitrogen from the air and put it into the soil. This helps the plants because they need nitrogen to grow but can only get it from the soil.

Some living things are so dependent on each other that they can only live together. Lichens are a good example of this. A lichen is actually two separate living things--a fungus and an algae (or a blue-green algae, now called a cyanobacterium) that live together. Although some of the fungi and some of the algae that form lichens can survive independently, many can not live without each other. In addition, by living together, they can live and grow in harsh environments where neither could live alone.

The above examples are cases where all the living things involved either benefitted by the association (called mutualism) or, at least, one benefitted and the others were not harmed (commensalism). One other sort of interdependence, called parasitism, benefits one of the species involved (the parasite), but harms (often even kills) the other (the host). In some ways, parasitism is similar to predation--except the parasite "predator" is usually much smaller than its prey. Many living things are parasitic for only part of their life cycle. Lamprey fish are a good example of a parasite. The adults attach themselves to larger fish then suck the blood of their host. The host may live for months after the lamprey attaches. Botfly lay their eggs on caribou; the larvae get under the animal's skin, and feed on its tissues. They then emerge, drop off, and develop into adults in the ground.

Vocabulary: *interdependent, pollen, pollination, spore (Optional--commensalism, mutualism, parasitism).*

Primary

Introductory Activity.

Objectives:

1. Students will learn the variety of ways that living things are interdependent.

Materials:

Ecosystem Partners Cards (Photocopy and cut up pages 34-37), bulletin board with labels (see below), pins

Procedure:

Before class---Make up a bulletin board with the three columns labeled as follows: They both help each other (mutualism); One helps the other (commensalism); and One needs the other, but the other is hurt (parasitism). (The scientific words given above are for your reference and need not be shown on the board. A good visual device (suggested by Marla Browne) to separate the categories are to show the partners as faces--both smiling; 1 smiling and the other with a straight line for a mouth, and 1 smailing, the other with a down-turned mouth.) (See Step 5 to decide if you will use this bulletin board.)

1. Review the last lesson that showed living things need the other living things that they eat. Give examples of animals that live in the same places because they are connected by a food chain. (For example, a lynx wouldn't live where there were no snowshoe hares to prey on, and a hare couldn't live where there were no willows, so we tend to find willows, snowshoe hares, and lynx together.)

2. Discuss the term association--for example-friends in the class who always are together, associate with each other. Explain that living things associate with one another, too, but in different ways. Can students think of any way that one animal might need another--besides for eating? Explain that the class is going to play a game to learn about some of the ways that some living things need each other.

3. Pass out the cards, one per student. (If there are more cards than students, you can play more than one round--just be sure that each time you pass out the cards that go together (marked by matching corner patterns). Now explain that each of the living things shown on the cards needs one or more other living things in order to survive. The object of the game is for each student to find their partner.

4. Have one student stand up and read their card. (Or, if student reading skills are inadequate, have one student come to the front of the room. You read their card out loud for them.) Any other player who has a living thing that they think could help or be helped by the standing student's should come up and link arms with him/her. The student that comes up should then read their card, (or you read the card for them) and the class decides if it is a good match. If the match is not right, the student returns to their seat, and another student comes up. Repeat until a partner is found. Then choose another student to read their card. Repeat until all students have found their partner.

5. (You may skip to step #6, if you do not think your students can handle this step.) Review the partners and why they belong together. Have the class decide which category on the bulletin board each pair of partners belong in. To help them understand the categorys, it may be helpful to have them think of the categorys as full sentences: "They live together because... When the association is classified, the group can pin their cards up in a row under the correct category. The next group in the same category will make a new row. Once the bulletin board is complete, encourage all students to take time to look at it and see all the different associations.

6. Use the Ecosystem Partners Worksheet to review and evaluate student understanding.

I need to live on the skin of an animal that swims around the sea.

Barnacle

I swim around the sea. I have a lot of skin.

Gray Whale

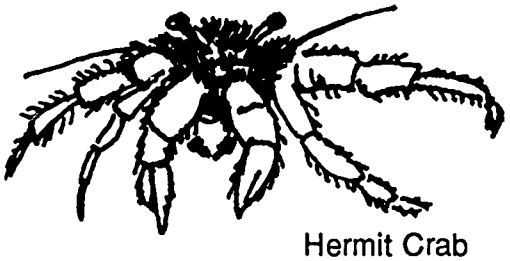
Before I get my wings, I grow inside a shell-like chrysalis.

Butterfly

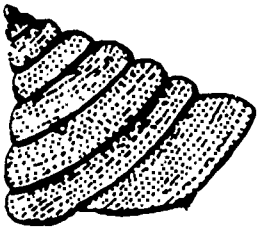
I need to lay my eggs next to an animal that lives inside something like a shell. When my young hatch they can eat that animal and live safely in its shell.

Wasp

I need an empty shell.



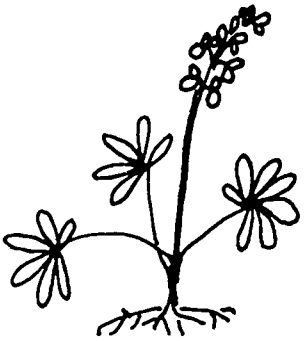
Hermit Crab



I am an empty shell. The snail that lived inside of me was eaten by a bird.

Snail

I need nitrogen in the soil, but it is only in the air.



Lupine

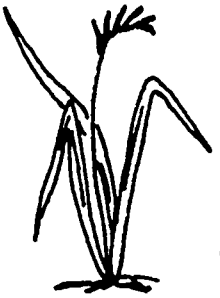
I take nitrogen from the air and put it in the soil.

Nitrogen-fixing Bacteria

Mountain Goat

I can carry seeds in my long shaggy hair. I travel from one mountain to another.

I need an animal with long fur to carry my seeds to another mountain.

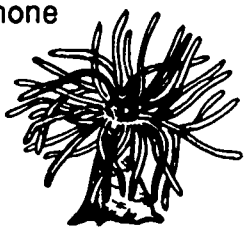


Grass

Algae

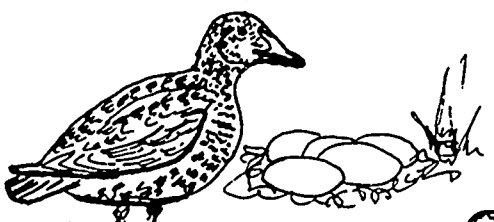
I need something that lives in the sea to protect me from predators. I will give oxygen and stored energy to anything that helps me.

Sea Anemone



I have stinging tentacles that protect me from predators. I will let an algae live inside my tentacles, if it will give me oxygen and stored energy.

I need something to chase foxes and jaegers away from my nest. I will nest near the animal that helps me.



Common Eider

Arctic Tern

I chase any fox or jaeger that comes near my nest or the nests of any other birds that nest nearby.

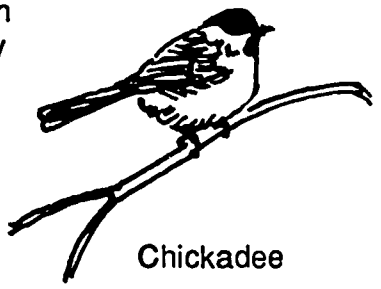
I need an animal to carry my seeds to a new place. The animal that helps me can eat some of my berries.

Dwarf Dogwood

I can carry seeds to new places. I like to eat berries.

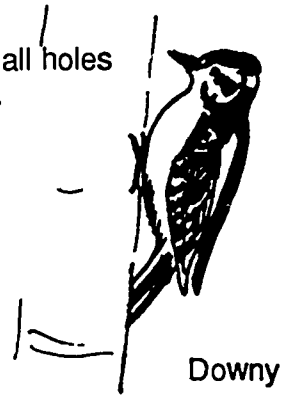
Red-backed Vole

I need a small hole in a tree for my nest.

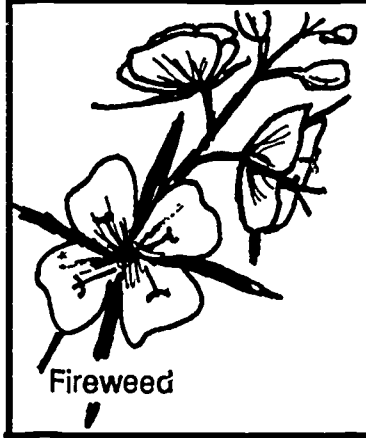


Chickadee

I dig small holes in trees.



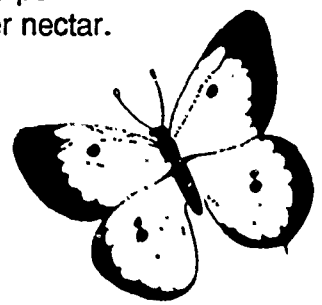
Downy Woodpecker



Fireweed

I need my pollen carried to another flower. My flowers have nectar.

I can carry pollen.
I eat flower nectar.

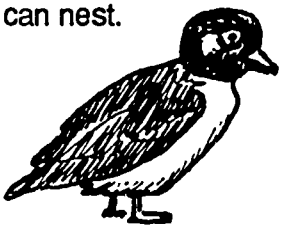


Butterfly

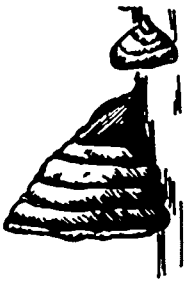
I make ponds and kill trees by building dams on streams.

Beaver

I need a pond with dead trees in it so I can nest.



Goldeneye Duck

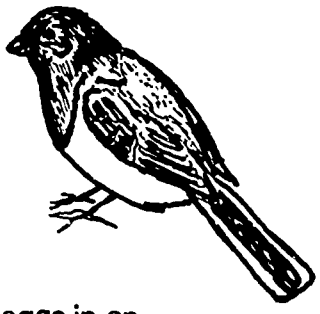


I make dead wood soft.

Shelf Fungi

I need a dead tree with soft wood so I can dig a nest hole.

Flicker



I lay my eggs in an open nest on the ground.

Junco

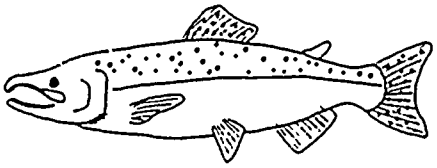
Cowbird

I need to lay my eggs in the nest of another bird. When my big chicks hatch out, the other bird will feed and raise them instead of its own.

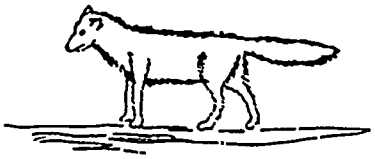
Lamprey

I need a big fish so I can attach myself and feed on its blood.

I am a big fish.



Salmon



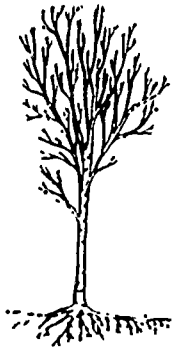
I need a big carnivore to kill a seal for me to eat.

Arctic Fox

Polar Bear

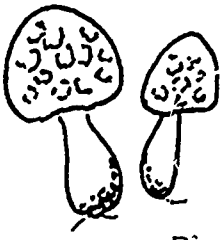
I kill seals to eat. I leave a lot of scraps for other animals to eat.

I need help to get minerals from the soil. I have some extrastored energy to give anything that helps me.



Birch Tree

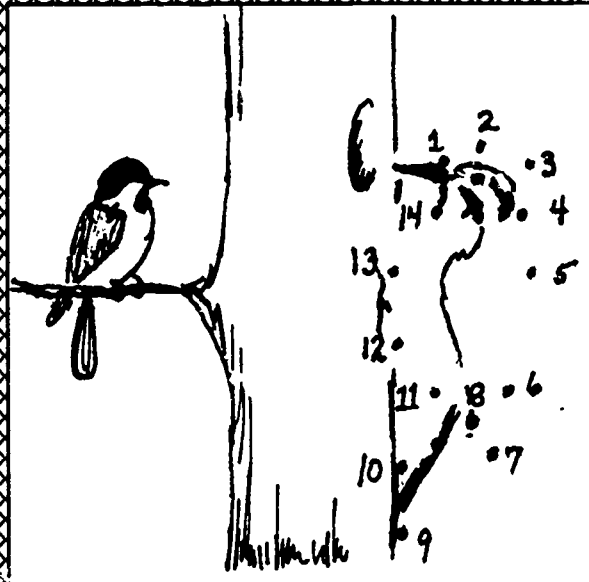
I can help a plant get minerals from the soil, if it will give me some of the energy it has stored.



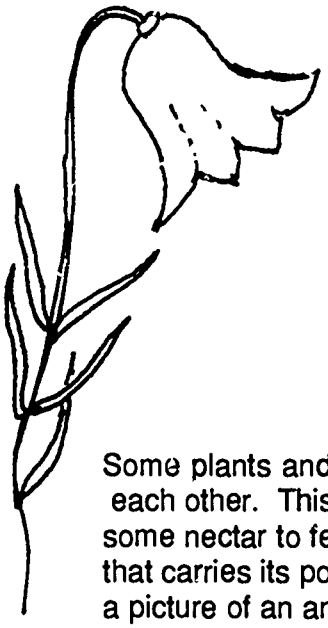
Pholiotus Mushroom

ECOSYSTEM PARTNERS

Name_____



This chickadee can't dig a hole in a tree, but it needs a hole for nesting. Connect the dots to find out what animal helps it.



Some plants and animals help each other. This flower has some nectar to feed the animal that carries its pollen. Draw in a picture of an animal that can help the flower.

This red-backed vole likes to eat berries and seeds. Draw a picture of a plant that this vole might help.

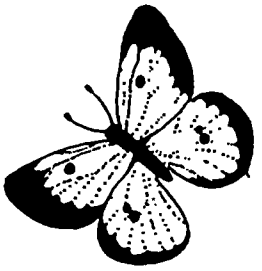
Ravens do not kill other animals. They pick up the scraps left by predators. Connect the dots to find an animal that could help the raven get food.

SCIENCE LANGUAGE ARTS

Objectives: Students will practice memory and listening skills and become more familiar with the inter-relationships of living things.

Materials: Ecosystem Partners cards, photocopy pages 34-37.

Procedure: This activity is for a station or group of 3-5 students. The dealer shuffles the Inter-relationships cards together, and deas a hand of 5 cards to each student. The object of the game is to find sets of cards that show living things that need each other. When a student gets a set of two or more that go together, they discard the set in front of them. At the end of the game the student with the highest number of discarded cards (not sets) wins. On each turn, a player asks one other player for a specific card by saying: I have a.... that needs some other living thing to ..... Do you have something that can help it. (Or, I have a .... that does.... Do you have something it can help). If the player that is asked has a card of something that can help (or needs help), they must say Yes, I have a .... that can help (or needs....). Then they must turn the card over to the other player who makes and discards the set. Since the player was successful, they get to ask for some other card. When a player is unsuccessful, they draw a card and the turn passes to the next player. Students should try to remember who has what cards in order to find the ones needed for a set. There are some sets of 3 or more. A player with 2 cards in such a set should discard them. Any player who gets a third card that goes with a set of 2 that has been discarded, can discard their matching card to their pile. If they do not discard it, and another student realizes the match, they can ask for the card and discard it to their pile. Game ends when all the cards are discarded.



SOCIAL STUDIES

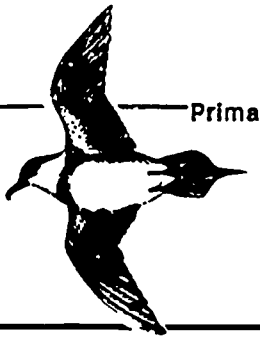
Objectives: Students will recognize that humans are interdependent with other living things, too.

Procedure: Review briefly that all living things do certain things that are important to other living things that live in the same ecosystem. Have students give some examples. All the living things in an ecosystem are sometimes called a community--the same word that is used to describe a group of people who are living together. Ask students whether or not humans do things that are important for other people that live in the same community? Have students name as many jobs done by people as they can think of. (baker, teacher, garbage collector, house builder, etc.) List these in column 1 on the blackboard. Label column 2, Non-living things and column 3, Living things. Then, go through each job listed and discuss whether the person doing the job needs things from the non-living environment (if so, list these in column 2) or other living things (if so, list in column 3), in order to do their job. When finished with this, ask students whether they think their human community could survive without the surrounding ecosystem. They should recognize that most of the jobs people do require things from the non-living environment or other living things--i.e. ecosystems.

Discuss this idea further. Are there any jobs done by living things in the ecosystem, that people can't do? (Make oxygen and food!, change waste materials back into minerals (we can do this with some materials by burning them) make soil, wood, rubber, certain medicines.) Students should recognize that humans are dependent on other living things for food, oxygen, mineral recycling, and materials for building. Are humans part of the ecosystem?

Lesson 6.

Primary



Students will recognize that in order to conserve any kind of wildlife, we must conserve all the non-living and living things in the ecosystem to which it belongs.

Background. The many inter-relationships between living things, and between living things and the non-living environment make ecosystems both resilent and fragile. Any change in the non-living surroundings, or in a population of any living thing, is likely to cause many other changes within an ecosystem. Changes in the non-living surroundings can affect all living things, because all use air, water, and minerals, and are affected by temperature, humidity, and light. A change in a population of one living thing will affect the populations of all the other living things it interacts with--through food chains and webs, or other kinds of interactions. The resulting changes in these populations, may in turn, affect the populations of all of the different living things these interact with. This chain reaction of changes means that a single change--in the non-living surroundings or in the population of a single kind of living thing--can indirectly affect many, or all, the living things in that ecosystem.

Ecosystems can and do tolerate and absorb changes in the non-living environment (such as weather and climatic changes, earthquakes, floods, etc.). Ecosystems can also tolerate and absorb changes in the numbers and kinds of living things present; extinction of certain species and invasion by others are natural and, over geologic time, constant occurrences. All ecosystems are in a state of constant change.

However, too many or severe changes in either the non-living surroundings, or the populations of living things can cause an ecosystem to fall apart. While such a collapse may make the area uninhabitable for its present residents, species with adaptions suitable for the changed environment may colonize and become established. After a long period of time, a new ecosystem may thus appear--with a whole different community of living things interconnected by different food webs and symbioses. In the long run, the collapse of an ecosystem may only be undesirable from the standpoint of survival of the particular organisms that were adapted for and dependent on the original ecosystem.

However, from a practical standpoint, we humans must be concerned the chain reaction of changes that can occur within ecosystems. We must be concerned if we are interested in conservation of any specific kind of wildlife, and if we are interested in human welfare. For the survival of every species (including the human species) depends not only on protection of its populations, but also on protection of the entire ecosystem in which it lives.

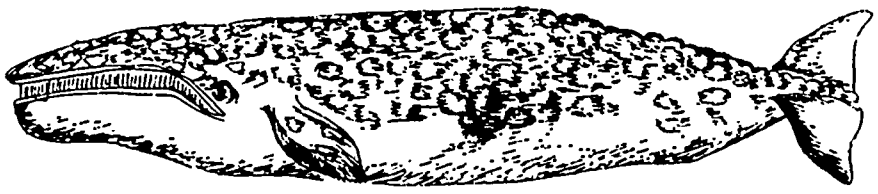
For example, in order to protect salmon, we must not only protect them, but also their non-living surroundings, and all the organisms they depend on. The non-living surroundings the salmon need include the stream water and gravel beds where the salmon eggs are laid and hatched, and the sea where the salmon grow to adult size. It also includes the stream's tributaries, the river the salmon use to migrate to and from the sea, and the rain water that forms the stream and river. The living things needed include those that produce the oxygen salmon need to breathe (phytoplankton and aquatic plants). It includes the shrubs and trees that grow beside the stream and providing cover, and the shade that moderates stream temperatures. Also included are the living things the salmon eat--from the stoneflies and other aquatic insects they eat as larvae to the herring and sand lance they eat as adults. It also includes the organisms the prey feed on--(dead plant materials (largely from the streamside trees and shrubs) and zooplankton, respectively). Finally, it also includes the organisms those depend on. (The plants depend on detritivores to recycle minerals, and may depend on animal pollinators and/or seed carriers, and on fungi or bacteria to help them obtain certain minerals; the zooplankton need phytoplankton.) Thus, if we intend to conserve salmon populations, we must also conserve all the parts of the ecosystem in which they live.

Vocabulary: *consequences*

Primary

People are often thought of as somehow separate from the surrounding wilds, but like all other living things, humans are a part of the earth's ecosystems. We need water, minerals, and air from our non-living surroundings. We need plants and algae to produce oxygen and maintain the composition of our atmosphere. We also need these producers to make food for animals and ourselves. We also depend on plants to reduce soil erosion, moderate our climates, and maintain the water cycle. We depend upon nitrogen-fixing bacteria and denitrifying bacteria to maintain the nitrogen cycle. We need bacteria and fungi to break down waste materials and recycle the raw materials needed by plants. About 80% of the biomass created by photosynthesis is ultimately broken down by detritivores--without them, all that biomass (leaf litter, dead animals, fecal wastes, etc.) would just accumulate! Humans also need certain chemicals produced by bacteria, fungi, and other organisms as medicines. And we need many of the materials made by plants (and animals) for clothing, shelter, and machinery (for example, wood, paper, cotton, silk, wool, rubber, certain oils). We also depend on predators, parasites, and disease-causing micro-organisms to keep populations of other organisms in check.

Clearly, we humans depend upon our non-living surroundings and other living things. We are a part of the earth's ecosystems. Thus, changes in the earth's ecosystems affect us as well as all other living things. Our worldwide population of over 4 billion humans is causing changes in most ecosystems of the world. Nearly every human activity affects ecosystems. Each change may have desirable or undesirable consequences. The important thing to recognize is that every activity has potential consequences. Even an activity that seems only to affect insects, or fungi, the upper atmosphere, or ground water supplies can have far-reaching consequences. We must be careful to ensure that the effects on the earth's ecosystems of any given human activity (or the cumulative effects of several activities) will be effects that we want--and that we can, very literally, live with.



Introductory Activity.

Objectives:

Students will learn that in order to protect any kind of wildlife, we must protect their non-living surroundings and all the other living things they depend upon.

Materials:

Large open area with grass or carpeting; reference materials on wildlife (may be able to do without).

Procedure:

Have the class nominate animals for the title "Our Favorite Animal," then take a vote to choose one. Assign 2 or 3 students to represent the favorite animal. Have the class list the parts of the non-living surroundings that their favorite animal needs--assign one student to represent each of the parts.

Have the class name the living things their favorite animal eats (write these on the board)--assign students to represent each of these. Have students list 2 things eaten by each of these animals (again write on the board), and assign students to represent those. Have students list 2 or 3 living things that make the oxygen needed by their favorite animal; write these on the board and assign one student to represent each one. Determine if there are other living things that help any of the living things so far listed (don't forget pollinators, seed carriers, etc.). List these on the board, and assign students to represent them.

Now , choose one of the least popular living things listed (or have the class vote on their least favorite animal--from those listed on the board.) Does the class think it would matter if people did something that caused that unpopular living thing to die out? (For example, if humans spread a poison that killed that organism, or destroyed its habitat.)

Explain that they are going to play a game to find out. Have students stand (or squat) in a circle on the grass or carpeted area. They represent parts of an ecosystem--but they are not yet an ecosystem, because they are all standing alone. In order to represent an ecosystem, they all must become interdependent. Ask them to place their hands on the shoulders of the person next to them. Then everyone should take a step toward the center of the circle and take the hand of the person just beyond the person next to them. (Hands should be grasped behind the back of the person next to each student.) Then have everyone lean back, knees straight, and walk their feet in toward the center. Then ask the student representing the unpopular living thing to let go. What happens? Was their favorite animal affected? Have the class discuss why we would need to protect all the living things listed on the board in order to protect their favorite animal.

Have the class make bumper stickers that say: Help save (name of their favorite animal), Protect (name of their least favorite living thing). Or have the class adopt the unpopular species. (Instead of adopting whales--adopt amphipods. Or instead of adopting hawks--adopt voles) Students can make posters, write poems, paragraphs, or banners declaring the importance of their unsung wildlife hero.

Help save the peregrine falcon....
Protect Craneflies!

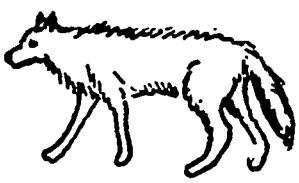
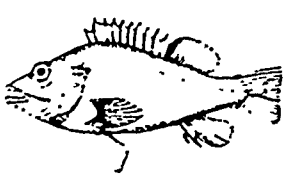
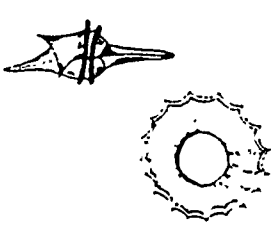
Primary

Who Needs Who

Name _____

_____

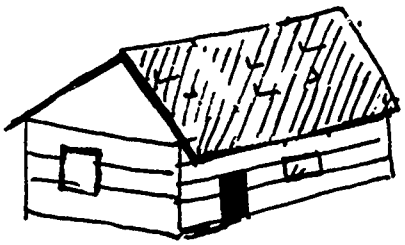
_____

We want to conserve populations of this animal.	Circle all the living things that we'll need to conserve, if we want to protect the animal listed in the first column.
 chickadee	 woodpecker  fungi  tree  insects
 wolf	 plants  insects  dall sheep  certain bacteria and fungi
 weasel	 vole  berry-producing plant  fungi
 harbor seal	 fish  tiny animals that live in the sea  algae

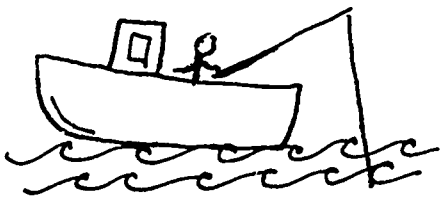
Primary

ECOSYSTEMS AND PEOPLE Name_____

Color in the human activities that affect ecosystems.



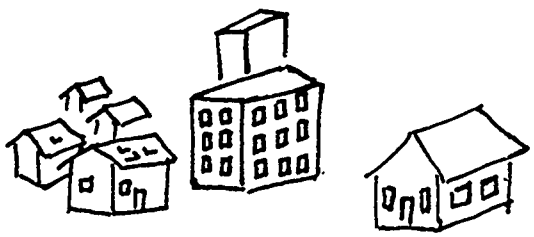
Building a house.



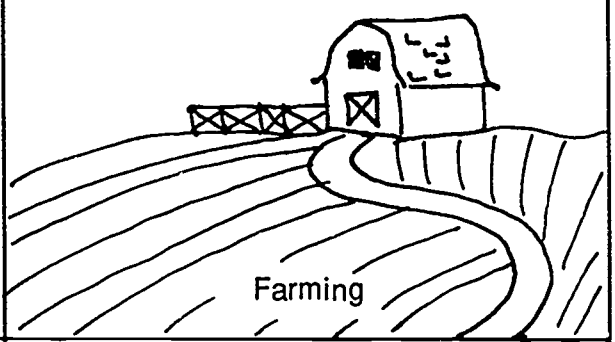
Fishing for salmon.

Driving cars, trucks, or snowmobiles.

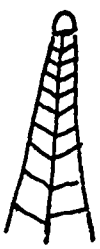
Cutting down trees to get wood.



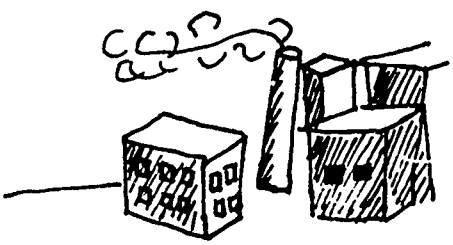
Building cities



Farming



Drilling for oil



Factories making toys.

ART

Objectives: Students will review the parts of an ecosystem and their interconnections by making a 3-dimensional model of the ecosystem around them.

Materials: A wide variety of art materials, such as construction, butcher, and crepe paper, scissors, glue, staples, paint, masking tape, and clay.

Procedure: Review the concept of an ecosystem and the variety of living and non-living things that occur in every ecosystem. Then ask students to convert the classroom, or a portion of the room into an ecosystem. Review the various kinds of art techniques students have used during the year and encourage them to be creative in thinking of ways to portray living and non-living things. You may want to assign one group each to construct models of animals, plants, fungi, protists (seaweeeds, algae, and protozoans), and non-living things. Or assign more specific groups(birds, mammals, mushrooms, lichens, trees, flowering plants, etc.) to individual students. Challenge students to portray representatives of all the living and non-living things in the ecosystem. They can observe or use references to find out the variety of things that occur. Encourage students to create models that portray the colors, textures, and size of the things they portray.

To evaluate the model, choose individual animals and help the class determine whether the ecosystem includes all the things they need to survive. Use the questions given in the introductory activity for a guide. If not, have students add the missing items. If desirable, you can have students show all the ecosystem interconnections using lengths of string.

When the ecosystem is complete, your students can invite another class in for a nature walk. Your students can be the naturalist/guides. Assign individual naturalists to show and tell the visiting students about the parts of the ecosystem (non-living environment and living things), the producers and their importance, ecosystem food chains, and organisms that need each other for other reasons.

SCIENCE / MATH / ART

Objectives: Students will recognize that human activities affect ecosystems by comparing areas with and without human disturbance.

Materials: Access to two outdoor sites-- one undisturbed site, and one affected by human activities, (a playground, parking lot, or lawn is adequate, but you may want to choose a site that is affected by an activity such as logging, mining, or agriculture), 11 x 17 drawing paper, pencils, crayons, clipboards or other drawing surface.

Procedure: Each student should be given a large sheet of drawing paper (11 x17). Have them fold the paper in half to form two 81/2 x 11 sheets; label one half--A Wild Ecosystem--and the other side, The Ecosystem after People Changed It. Visit the undisturbed site first, and have students walk around to look for animal sign and explore first. Then have them sit down and observe the area right where they are sitting. Then ask them to draw a picture of the ecosystem they see on the half of their paper labeled A Wild Ecosystem. Guide them through the drawing by having them first draw and color the non-living environment. Encourage them to note the exact color of the sky, the air, the water, and the soil.

Then ask them to count the number of different kinds of producers (plants and algae) that they see (record this number) then draw the producers into their picture. Then, have them look for animals or their sign (make sure they examine the ground for droppings and insects, and plant leaves and stems for signs of browse and for insects). Count up the number of different kinds found, then have students draw these into their pictures. As a last step, have them look for fungi, count the different kinds, then add them to their drawings. Then, have them turn their papers over and go to the disturbed site and repeat the above steps.

When students have completed the two drawings, have them open up their folded papers to show their two pictures side by side. Discuss the differences, if any, in the color of the air, water, and soil at the two sites. Use the numbers that you recorded to have students make bar graphs of the numbers of animals, producers, and fungi found at each site. Have students compare what the bar graphs show to what they show in their drawings. Then discuss the differences in the number and kinds of producers, animals, and fungi at the two sites.

SOCIAL STUDIES

Objectives: Students will recognize that human actions can harm ecosystems.

Procedure: (If you keep the information from the introductory activity on the board, you can skip the second step of this activity--just draw lines to show the interconnections of the various living and non-living things listed).

1. Have the class make a list of all the things that people do around your area. Discuss how each of these activities might directly affect the non-living environment (air, water, and soil), or living things (plants, animals, fungi, microscopic organisms)? Write the effects on the board next to the activity. (See the background section for examples).

2. Choose an animal that lives in your area, then have students list the living and non-living things needed by this animal. (Does the animal drink water? Breathe the air? Does the animal breathe oxygen made by the plants? Which living things does it eat? Does it depend on other living things? List the different things it needs on the board and draw lines to connect these to the animal. Then, have students figure out what each of the listed living things needs. (Do the plants need soil? sunlight? water? pollinaters? seed carriers? decomposers to recycle minerals? What do each of the living things eat--do they depend on other living things?) List these and draw lines to show connections.

3. Review the list of things people do that affect living and non-living things. How many of the activities affect something that is connected to the animal of concern by lines? These activities could affect populations of that animal. Students should recognize that everything humans do can affect living things. Discuss and compare the effects of one person doing a certain activity, and 100, 1000, or 4 billion people doing that activity.

MUSIC

Objectives: Students will strengthen their understanding that all the parts of an ecosystem are important, by comparing an ecosystem to a symphony.

Materials: Recordings of the sounds of a variety of instruments; a recording of an orchestra (or band) of those instruments playing a symphony (or modern music)

Procedure: Have children listen to examples of each of the instruments being played individually. Then, ask them to listen to the symphony. Ask students what instrument played the symphony? Do they realize it was made by many instruments playing together. Have the children listen again and try to pick out the different instruments that are combining to play the symphony. Could any single instrument make the symphony music? How would the symphony sound if some instruments were removed.

Have the class compare an ecosystem to an orchestra. How are they similar? (All the players (instruments / organisms) are a part of the whole (orchestra / ecosystem)--each does something different, but all are important.) Does the beauty we perceive when looking at a forest, tundra, ocean, or wetland compare at all to the beautiful sounds of a symphony?

Divide the class into groups and assign each group to figure out the sounds or motions made by non-living things or certain living things in the ecosystem around them. The group assigned to non-living things might think of the sounds made by the wind, water rushing, or thunder.) Assign other groups to represent plants, birds, mammals, fungi, protists, and monerans (or make up your own groups). These groups can think of sounds or motions that these organisms actually make, or just choose certain sounds or insturments to represent them.

Write the names of the groups in a column on the board. Explain that each group will sound off, or show its motions when a line shows in their row. Write a "musical score," with short and long lines to show when the various groups are to "play." Students can help--you may want the score to represent a day (dawn, morning, afternoon, etc.; or the seasons) Then, you, the conductor, keep time so that all the groups know where on the score the "orchestra" is during their ecosystem symphony. (You can vary the "musical score" to demonstrate a variety of rhythms, or types of music.)

A GUIDE TO THE FIVE KINGDOMS OF LIVING THINGS

The information below is provided as background information for teachers on the 5 major groups of living things--their characteristics and ecological roles. This 5 kingdom classification has replaced the older division of living things into two kingdoms--plants and animals. See the poster that accompanies this packet for illustrations of representative organisms. (Much of the information presented in this table was modified from "Biology," 4th ed., by Helena Curtis, Worth Publishers, New York.)

Kingdom Monera

This kingdom includes the smallest and most primitive living things, bacteria and cyanobacteria (formerlly called blue-green algae). All monerans are made up of only one cell. Some monerans live together in colonies (as filaments for example) and thus may superficially appear to be multicellular organisms. These microscopic organisms are differentiated from all other living things by the lack of a cell nucleus. The genetic material of monerans floats freely in their cell fluids. They do not have mitochondria or chloroplasts. Most monerans absorb their foods (nutrients), but some are capable of photosynthesis. Most monerans reproduce asexually by fission or budding. Monerans are very important ecologically as decomposers; cyanobacteria are important producers. Many monerans are symbionts with other living things. Certain bacteria live in the intestinal tracts of animals and help digest foods, or produce needed nutrients. Some bacteria live in or on the roots of plants and help them absorb nutrients from the soil. Some cyanobacteria and fungi form lichens. Some bacteria cause diseases in plants and animals..

Kingdom Protista

This kingdom includes nearly all other single-celled organisms (including algae and protozoans), slime molds (which have many cell nuclei with in a single cell) and multicellular algae (the seaweeds or kelp). (Brown, green, red, golden-brown, and fire algae; diatoms and dinoflagellates belong to this kingdom). This kingdom includes only organisms with a cell nucleus. Algae (both single celled and multicellular) are very important producers, particularly in aquatic ecosystems. Some protozoans can do photosynthesis, while others are consumers; some protozoans obtain nutrients using photosynthesis and by consuming other living things. Protists move by use of flagella, cilia, or pseudopodia; some kindsdo not move from place to place.

Kingdom Fungi

This kingdom includes organisms that have a cell nucleus. Most are made up of filaments of cells, but a few aresingle-celled. It includes mildews, morels, truffles, mushrooms, toadstools, shelf fungi, yeasts and molds. Lichens are made up of a fungi living together with an algae or cyanobacteria. All fungi obtain food (nutrients) by absorbing it. Many fungi are extremely important as decomposers. They give off certain enzymes that break down organic material (dead organisms and waste materials), then absorb the nutrients broken down by their enzymes. Other fungi, particularly mushrooms are very important because of their symbiotic relationships with plants, or mycorrhizal. Mycorrhizal fungi live on or in the roots of plants and in exchange for nutrients from the plant root, they help the plant absorb minerals from the soil. Other fungi are parasitic, on plants or animals (athlete's foot for example). We often just see the reproductive part of fungi (for example, a mushroom); the main part, tiny thread-like extensions called hyphae, extend inside and through the wood, soil, leaf litter, roots, or other material on which the fungi is growing. Fungi reproduce asexually by spores, and sexually.

Kingdom Plantae

This kingdom includes mosses, liverworts, ferns, horsetails, conifers, and flowering plants. These organisms are characterized by having cells with nuclei and a cell wall; and the highly organized arrangement of their many cells. All are capable of photosynthesis, and most are green. All except the mosses and liverworts have leaves, roots, and stems and a system for transporting water and organic materials among the many cells. Plants are extremely important ecologically in their role as the major producers in terrestrial ecosystems. All plants live a stationary life.

Kingdom Animalia

This kingdom includes sponges, jellyfish, hydra, and anemones; flatworms; molluscs (snail- and clam-like organisms, chitons and octopi); segmented worms; other worms; arthropods (horseshoe crabs, spiders, crabs shrimp, centipedes; millipedes and insects); bryophytes (moss animals); starfish, sea urchins, and sea cucumbers; lamprey, sharks, rays, fish, amphibians, reptiles, birds, and mammals. These are all characterized by having cell nuclei, lacking a cell wall, and the highly organized arrangement of their many cells. All animals obtain energy and minerals by eating other living things; they are consumers. Most animals move around alot.

ALASKAN FOOD CHAIN AND FOOD WEB EXAMPLES

Six food chain examples for forest, tundra, wetland and ocean are shown in bold letters. Make food webs by using the other foods of each living thing (listed in small letters below its name) to find other interconnections. Use with the activities in Lessons 1, 2, and 3 of this unit. Use information provided on the back of the photo poster (from this and Alaska Wildlife Week Units 1, 2, & 3--check your library). See the 1984 unit for more background on wetland food webs.

	PRODUCER	HERBIVORE	CARNIVORE 1	CARNIVORE 2	DETRITIVORE
FOREST	1. White Spruce	**Red Squirrel** berries, mushrooms	**Marten** voles, bird eggs		**Mushroom** any dead plant
	2. Willow	**Snowshoe Hare** birch, grass, fireweed	**Lynx** voles, squirrels		**Raven** any dead animal
	3. Grass Seeds	**Red-backed Vole** berries, fireweed	**Boreal Owl** flycatcher, woodpecker		**Fly** any dead animal
	4. Lingonberry	**Pine Grosbeak** spruce and birch seeds	**Goshawk** squirrel, flycatcher, woodpecker		**Bacteria** any dead thing
	5. Fireweed	**Moth**	**Alder Flycatcher** flies, beetles	**Merlin** pine grosbeak	**Beetle** any dead animal
	6. White Birch	**Bark Beetles** spruce	**Downy Woodpecker** moth, berries		**Shelf Fungus** any dead wood
TUNDRA	1. Lichen	**Caribou** dryas, willow, sedge	**Brown Bear** sedge, grass, blueberry		**Bacteria** any dead thing
	2. Dryas	**Dall Sheep** willow, sunflower, sedge	**Wolf** caribou, marmot		**Raven** any dead animal
	3. Willow	**Redpoll** willow, sunflower, sedge	**Arctic Fox** singing vole, any dead animal		**Flies** any dead animal
	4. Grass	**Singing Vole** sedge, sunflower, dryas	**Short-tailed Weasel** redpoll		**Springtail** any dead plant
	5. Sunflower	**Butterfly** blueberry, mountain avens	**Golden Plover** flies, springtail, blueberry	**Jaeger** redpoll, vole	**Bacteria** any dead thing
	6. Sedge	**Marmot** grass, sunflower	**Wolverine** fox, any dead animal		**Mushroom** any dead plant
	7. Blueberry	**Willow Ptarmigan** willow, sedge	**Golden Eagle** marmot, weasel, sheep (lamb only)		**Fly** any dead animal
WETLAND	1. Algae	**Water Fleas** dead plants, protozoans	**Stickleback** midge, rotifer	**Common Loon** frog	**Bacteria** any dead thing
	2. Pondweed	**Pintail** algae, seeds of sedges	**Peregrine Falcon** phalarope		**Rotifer** any dead producer, protozoans
	3. Algae	**Midge** algae, dead plants	**Wood Frog** flies, mosquitos	**Sandhill Crane** stickleback, sedges	**Water Flea** any dead producer, rotifer
	4. Sedges	**Muskrat** pondweed	**Mink** stickleback, phalarope		**Bacteria** any dead thing
	5. Willow	**Moose** willow, sedge	**Wolf** muskrat, pintail		**Flies** any dead animal
	6. Algae	**Mosquito Larvae** protozoans	**Red Phalarope** midge, water flea, rotifer	**Parasitic Jaeger**	**Protozoans** any dead material, algae
OCEAN	1. Green Algae	**Sea Urchin** kelp	**Sea Otter** crab, sculpin, sea star		**Tanner Crab** any dead animla
	2. Kelp	**Snails** green algae	**Sea Star** sea urchin, sea cucumber, shrimp		**Flatfish** any dead animal, snails, fish
	3. Diatom (algae)	**Amphipod** other algae, kelp	**Sculpin** shrimp, sand lance	**Sea Anemone** sand lance, snails	**Shrimp** any dead material
	4. Sea Grass	**Brant** green algae	**Bald Eagle** herring, guillemot, any dead animal		**Marine Worm** any dead plant, algae
	5. Brown algae	**Copepods** other algae, sea grass	**Sand Lance** amphipod, euphausids	**Pigeon Guillemot** sculpin, herring	**Sea Cucumber** any dead thing
	6. Red algae	**Euphausids** other algae, diatoms	**Herring** copepods, sand lance	**Harbor Seal** sand lance, flatfish	**Gull** any dead animal

Reference List

The following references were used in preparing this Alaska Wildlife Week Unit. These references are organized to allow the reader to find further information about living things and ecology. References that will be particularly useful to teachers are preceded by an asterisk.

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